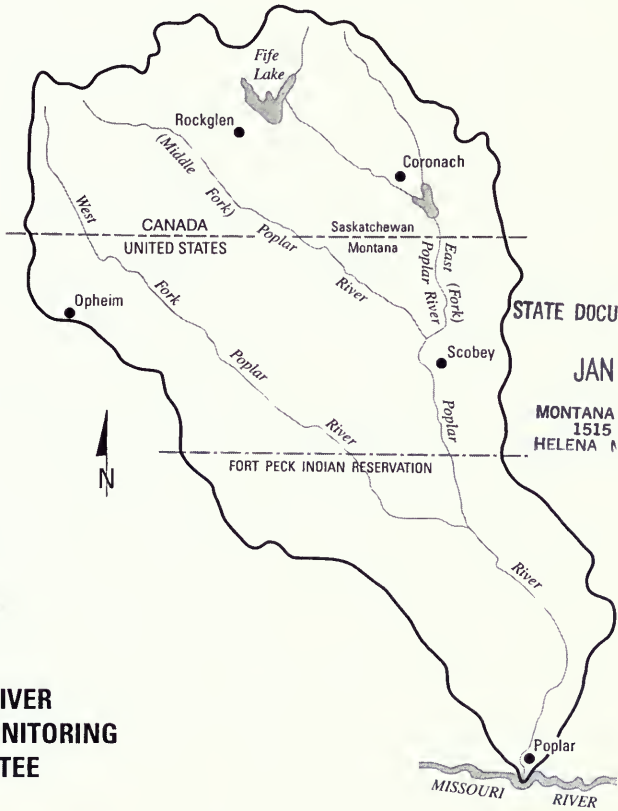
2003 ANNUAL REPORT

to the

GOVERNMENTS OF CANADA, UNITED STATES,

SASKATCHEWAN AND MONTANA



by the

POPLAR RIVER
BILATERAL MONITORING
COMMITTEE

COVERING CALENDAR YEAR 2003

November 2004

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POPLAR RIVER BILATERAL MONITORING COMMITTEE

COVERING CALENDAR YEAR 2003

November 2004

Poplar River Bilateral Monitoring Committee

Department of State
Washington, D.C., United States

Department of Foreign Affairs
and International Trade Canada
Ottawa, Ontario, Canada

Governor's Office
State of Montana
Helena, Montana, United States

Saskatchewan Environment
Regina, Saskatchewan, Canada

Ladies and Gentlemen:

Herein is the 23rd Annual Report of the Poplar River Bilateral Monitoring Committee. This report discusses the Committee activities of 2003 and presents the Technical Monitoring Schedules for the year 2004.

During 2003, the Poplar River Bilateral Monitoring Committee continued to fulfil the responsibilities assigned by the governments under the Poplar River Cooperative Monitoring Agreement dated September 23, 1980. Through exchange of Diplomatic Notes in March 1987, July 1992, July 1997, and March 2002, the Arrangement was extended. The Monitoring Committee is currently extended to March 2007.

The enclosed report summarizes current water-quality conditions and compares them to guidelines for specific parameter values that were developed by the International Joint Commission under the 1977 Reference from Canada and the United States. After evaluation of the monitoring information for 2003, the Committee finds that the measured conditions meet the recommended objectives including boron and total dissolved solids (TDS). Concerns over an upward trend in the concentrations of TDS in the East Poplar River between the late 1980's and 1995 were investigated. The results of the investigation indicated that the temporal changes in TDS concentrations were most likely primarily linked to natural drought events.

Based on IJC recommendations, the United States was entitled to an on-demand release of 370 dam^3 (300 acre-feet) from Cookson Reservoir in 2003. A volume of 386 dam^3 (313 acre-feet) was delivered to the United States during this period. In addition, daily flows in 2003 met or exceeded the minimum flow recommended by the IJC except for June 7-11, June 13 to September 9, September 11, and December 28-31.

Several changes were made in the Technical Monitoring Schedules for the year 2003. The ground-water monitoring network operated by SaskPower was reduced from 180 piezometers to about 85 piezometers after receiving approval from Saskatchewan Environment. This reduction was based upon modelling studies undertaken by SaskPower. In 2003, due to a reduction in available funding and using specific conductance to estimate TDS, the number of surface-water-quality samples collected at both Poplar River boundary stations by the U.S. Geological Survey was reduced from six per year to four per year. In 2004, the number of surface-water-quality samples collected at these stations will be reduced further, with the U.S. Geological Survey collecting four samples and Environment Canada collecting none.

Yours sincerely,

Robert Davis
Chairman, United States Section

R Z Kellow
Richard Kellow
Chairman, Canadian Section

Jack Stults
Member, United States Section

Chuck Bosgoed
Member, Canadian Section

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The Poplar River Power Station completed its twentieth full year of operation in 2003. The two 300-megawatt coal-fired units generated 4,470,455 gross megawatt hours (MWh) of electricity. The average capacity factors for Units No. 1 and 2 were 84.5 percent and 83.0 percent, respectively. The capacity factors are based on the maximum generating rating of 305 MW/h for both Unit No.1 and Unit No. 2. Similar to other years, scheduled maintenance was completed in the spring and fall of 2003.

Monitoring information collected in both Canada and the United States during 2003 was exchanged in the spring of 2004. Several changes were made in the Technical Monitoring Schedules for the year 2003. The ground-water monitoring network operated by SaskPower was reduced from 180 piezometers to about 85 piezometers after approval from Saskatchewan Environment. This reduction was based upon modeling studies undertaken by SaskPower. In 2003, due to a reduction in available funding and using specific conductance to estimate total dissolved solids (TDS), the number of surface-water-quality samples collected at both Poplar River boundary stations by the U.S. Geological Survey was reduced from six per year to four per year. In 2004, the number of surface-water-quality samples collected at these stations will be reduced further, with the U.S. Geological Survey collecting four samples and Environment Canada collecting none.

The recorded volume of the Poplar River at International Boundary from March 1 to May 31, 2003 was 10,050 dam^3 (8,150 acre-feet). Based on International Joint Commission (IJC) recommendations and the assumption that the recorded flow is the natural flow, the United States was entitled to a minimum discharge on the East Poplar River of 0.085 cubic metres per second (m^3/s) (3.0 cubic feet per second (ft^3/s)) for the period June 1, 2003 to August 31, 2003 and 0.057 m^3/s (2.0 ft^3/s) for the period September 1, 2003 to May 31, 2004. The minimum flow of 0.028 m^3/s (1.0 ft^3/s) for the period January 1 to May 31, 2003 had previously been determined on the basis of the Poplar River flow volume for March 1 to May 31, 2002. Daily flows in 2003 met or exceeded the minimum flow recommended by the IJC except for June 7-11, June 13 to September 9, September 11, and December 28-31.

In addition to the minimum flow, the IJC apportionment recommendation entitles the United States to an on-demand release to be delivered on the East Poplar River during the twelve-month period commencing June 1. Based on the runoff volume of 3,960 dam^3 (3,210 acre-feet) recorded at the Poplar River at International Boundary gauging station for March 1 through May 31, 2002, the United States was entitled to an additional release of 370 dam^3 (300 acre-feet) from Cookson Reservoir during the succeeding twelve-month period commencing June 1, 2002. Montana requested this release to be made between May 1 and May 31, 2003. A volume of 386 dam^3 (313 acre-feet), in addition to the minimum flow, was delivered during this period.

The 2003 five-year TDS flow-weighted concentrations were below the long-term objective of 1,000 milligrams per litre (mg/L). The maximum monthly value calculated in 2003 was 887 mg/L, which was less than the maximum monthly value in 2002. Boron water-quality sample data was incomplete and no analysis was conducted.

1.0 INTRODUCTION

The Poplar River Bilateral Monitoring Committee was authorized for an initial period of five years by the Governments of Canada and the United States under the Poplar River Cooperative Monitoring Arrangement dated September 23, 1980. A copy of the Arrangement is attached to this report as Annex 1. Through exchange of Diplomatic Notes, the Arrangement was extended in March 1987, July 1992, July 1997, and March 2002. The current extension expires in March 2007. A more detailed account of the historical background of the Monitoring Arrangement is contained in the 1990 Annual Report of the Poplar River Bilateral Monitoring Committee.

The Committee oversees monitoring programs designed to evaluate the potential for transboundary impacts from SaskPower's (formerly Saskatchewan Power Corporation) coal-fired thermal generating station and ancillary operations near Coronach, Saskatchewan. Monitoring is conducted in Canada and the United States at or near the International Boundary for quantity and quality of surface and ground water and for air quality. Participants from both countries, including Federal, State and Provincial agencies, are involved in monitoring.

The Committee submits an annual report to Governments which summarizes the monitoring results, evaluates apparent trends, and compares the data to objectives or standards recommended by the International Joint Commission (IJC) to Governments, or relevant State, Provincial, or Federal standards. The Committee reports to Governments on a calendar year basis. The Committee is also responsible for drawing to the attention of Governments definitive changes in monitored parameters which may require immediate attention.

A responsibility of the Committee is to review the adequacy of the monitoring programs in both countries and make recommendations to Governments on the Technical Monitoring Schedules. The Schedules are updated annually for new and discontinued programs and for modifications in sampling frequencies, parameter lists, and analytical techniques of ongoing programs. The Technical Monitoring Schedules listed in the annual report (Annex 2) are given for the year 2004. The Committee will continue to review and propose changes to the Technical Monitoring Schedules as information requirements change.

2.0 COMMITTEE ACTIVITIES

2.1 Membership

The Committee is composed of representatives of the Governments of the United States of America and Canada, the State Government of Montana, and the Provincial Government of Saskatchewan. In addition to the representatives of Governments, two ex-officio members serve as local representatives for the State of Montana and Province of Saskatchewan.

During 2003, the members of the Committee included: Mr. R. Davis, U.S. Geological Survey, United States representative and Cochair; Mr. R. Kellow, Environment Canada, Canadian representative and Cochair; Mr. J. Stults, Montana Department of Natural Resources and Conservation, Montana representative; Mr. C. Bosgoed, Saskatchewan Environment, Saskatchewan representative; Mr. C.W. Tande, Daniels County Commissioner, Montana local ex-officio representative; and Mr. J.R. Totten, Reeve, R.M. of Hart Butte, Saskatchewan local ex-officio representative.

2.2 Meetings

The Committee met on June 17-18, 2003, in Helena, Montana. Delegated representatives of Governments, with the exception of the two ex-officio members from Montana and Saskatchewan, attended the meeting. In addition to Committee members, several technical advisors representing Federal, State, and Provincial agencies participated in the meeting. During the meeting, the Committee reviewed the operational status of the Poplar River Power Station and associated coal-mining activities; examined data collected in 2002 including surface-water quality and quantity, ground-water quality and quantity, and air quality; discussed proposed changes in the water-quality sampling program, and established the Technical Monitoring Schedules for the year 2004.

In 2003, due to a reduction in available funding and using specific conductance to estimate total dissolved solids (TDS), the number of surface-water-quality samples collected at the Poplar River stations by the U.S. Geological Survey was reduced from six per year to four per year. In 2004, the number of surface-water-quality samples collected at these stations will be reduced further, with the U.S. Geological Survey collecting four samples and Environment Canada none.

2.3 Review of Water-Quality Objectives

The International Joint Commission in its Report to Governments, titled "Water Quality in the Poplar River Basin", recommended that the Committee "periodically review the water-quality objectives with the overall Basin context and recommend new and revised objectives as appropriate". In 1991, an action item from the annual Committee meeting set in motion the review and revision of the water-quality objectives.

In 1993, the Committee approved changes in water-quality objectives recommended by the subcommittee that was formed in 1992 to review the objectives. The Committee also discussed the water-quality objectives for 5-year and 3-month flow-weighted concentrations for total dissolved solids and boron. Although the Committee agreed that calculation procedures to determine flow-weighted concentrations are time consuming and probably scientifically questionable, no consensus was reached on alternative objectives or procedures.

In 1997, the Committee agreed to suspend the monitoring and reporting of several parameters. The parameters affected were: dissolved aluminum, un-ionized ammonia, total chromium, dissolved copper, mercury in fish tissues, fecal coliform, and total coliform. The Committee also agreed to other minor revisions for clarification purposes. For example, changing the designation for pH from "natural" to "ambient".

In 1999, the Committee replaced the term "discontinued" with "suspended" in Table 2.1.

In 2001, the Committee suspended the monitoring of dissolved mercury and total copper. This decision to suspend these parameters was based on data indicating concentrations or levels well below or within the objectives. Current objectives approved by the Committee are listed in Table 2.1.

The Committee also agreed to periodically review all suspended parameters.

Another responsibility of the Committee has included an ongoing exchange of data acquired through the monitoring programs. Exchanged data and reports are available for public viewing at the agencies of the participating governments or from Committee members.

2.4 Data Exchange

The Committee is responsible for assuring exchange of data between governments. The exchange of monitoring information was initiated in the first quarter of 1981 and was an expansion of the informal quarterly exchange program initiated between the United States and Canada in 1976. Until 1991, data were exchanged on a quarterly basis. At the request of the Committee, the United States and Canada agreed to replace the quarterly exchange of data with an annual exchange effective at the beginning of the 1992 calendar year. Henceforth, data will be exchanged once each year as soon after the end of the calendar year as possible. However, unusual conditions or anomalous data will be reported and exchanged whenever warranted. No unusual conditions occurred during 2003 which warranted special reporting.

Table 2.1 Water-Quality Objectives

Parameter	Present Objective	Recommendation	New Objective
Boron, total	3.5/2.5[1]	Continue as is	---
TDS	1500/1000[1]	Continue as is	---
Aluminum, dissolved	0.1	Suspend*	---
Ammonia, un-ionized	0.02	Suspend*	---
Cadmium, total	0.0012	Continue as is	0.0012
Chromium, total	0.05	Suspend*	---
Copper, dissolved	0.005	Suspend*	---
Copper, total	1	Suspend*	---
Fluoride, dissolved	1.5	Continue as is	1.5
Lead, total	0.03	Continue as is	0.03
Mercury, dissolved	0.0002	Suspend*	---
Mercury, fish (mg/kg)	0.5	Suspend*	---
Nitrate	10	Continue as is	10
Oxygen, dissolved	4.0/5.0[2]	Objective applies only during open water	4.0/5.0[2]
SAR (units)	10	Continue as is	10
Sulfate, dissolved	800	Continue as is	800
Zinc, total	0.03	Continue as is	0.03
Water temperature (C)	30.0[3]	Continue as is	30.0[3]
pH (units)	6.5[4]	Continue	6.5[4]
Coliform (no./100 mL)			
Fecal	2000	Suspend*	---
Total	20000	Suspend*	---

Units in mg/L except as noted.

1. Five-year average of flow-weighted concentrations (March to October) should be <2.5 boron, <1,000 TDS.
   Three-month average of flow-weighted concentration should be <3.5 boron and <1500 TDS.
2. 5.0 (minimum April 10 to May 15), 4.0 (minimum remainder of year - Fish Spawning).
3. Natural temperature (April 10 to May 15), <30 degree Celsius (remainder of year)
4. Less than 0.5 pH units above ambient, minimum pH=6.5.

*Suspended after review of historic data found sample concentrations consistently below the objective. The Committee will periodically review status of suspended objectives.

3.0 WATER AND AIR: MONITORING AND INTERPRETATIONS

3.1 Poplar River Power Station Operation

In 2003, the two 300-megawatt coal-fired units generated 4,470,455 gross megawatt hours (MWh) of electricity. The average capacity factors for Unit No. 1 and 2 were 84.5 percent and 83.0 percent, respectively. The capacity factors are based on the maximum generating rating of 305 MW/h for both Unit No.1 and Unit No. 2. Similar to other years, scheduled maintenance was completed in the spring and fall of 2003.

3.2 Surface Water

3.2.1 Streamflow

Streamflow in the Poplar River basin was normal in 2003. The March to October recorded flow of the Poplar River at International Boundary, an indicator of natural flow in the basin, was 10,700 cubic decametres (dam^3) (8,670 acre-feet), which was 104 percent of the 1931 to 2000 median seasonal flow of 10,290 dam^3 (8,340 acre-feet). A comparison of 2003 monthly mean discharge with the 1931-2000 median monthly mean discharge is shown in Figure 3.1.

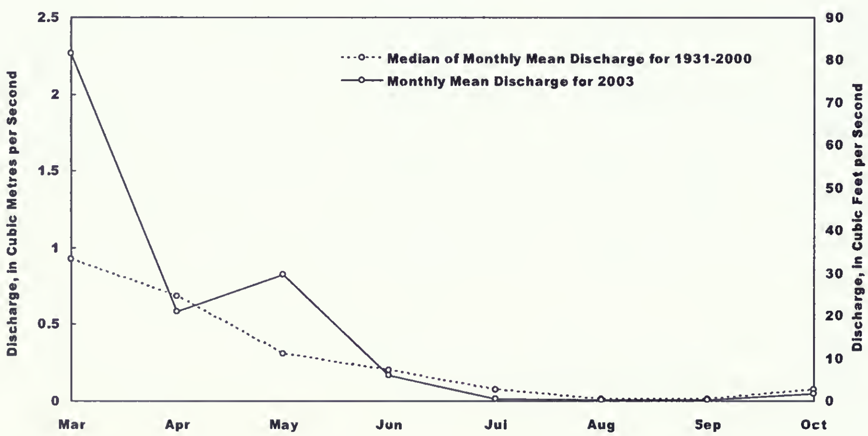


Figure 3.1 Discharge during 2003 as Compared with the Median Discharge from 1931-2000 for the Poplar River at International Boundary.

The 2003 recorded flow volume of the East Poplar River at International Boundary was 2,300 dam^3 (1,860 acre-feet). This volume is 77 percent of the median annual flow of 2,980 dam^3 (2,420 acre-feet) for 1975-2002 (since the completion of Morrison Dam).

3.2.2 Apportionment

In 1976 the International Souris-Red Rivers Engineering Board, through its Poplar River Task Force, completed an investigation and made a recommendation to the Governments of Canada and the United States regarding the apportionment of waters of the Poplar River basin. Although not officially adopted by the two countries, the Poplar River Bilateral Monitoring Committee has adhered to the apportionment recommendations in each of its annual reports. Annex 3 contains the apportionment recommendation.

3.2.3 Minimum Flows

The recorded volume of the Poplar River at International Boundary from March 1 to May 31, 2003 was 10,050 dam^3 (8,150 acre-feet). Based on IJC recommendations and the assumption that the recorded flow is the natural flow, the United States was entitled to a minimum discharge on the East Poplar River of 0.085 cubic metres per second (m^3/s) (3.0 cubic feet per second (ft^3/s)) for the period June 1, 2003 to August 31, 2003 and 0.057 m^3/s (2.0 ft^3/s) for the period September 1, 2003 to May 31, 2004. The minimum flow for the period January 1 to May 31, 2003 was 0.028 m^3/s (1.0 ft^3/s), determined on the basis of the Poplar River flow volume for March 1 to May 31, 2002. A hydrograph for the East Poplar River at International Boundary and the minimum flow as recommended by the IJC are shown in Figure 3.2.

Daily flows during 2003 met or exceeded the minimum flow recommended by the IJC throughout the year except for June 7-11, June 13 to September 9, September 11 and December 28-31, when daily flows fell below the recommended minimum.

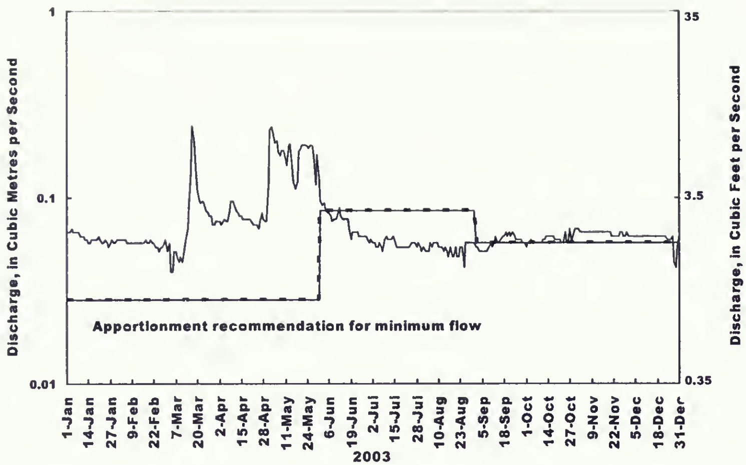


Figure 3.2 Flow Hydrograph of the East Poplar River at International Boundary.

3.2.4 On-Demand Release

In addition to the minimum flow, the IJC apportionment recommendation entitles Montana to an on-demand release to be delivered on the East Poplar River during the twelve-month period commencing June 1. Based on the runoff volume of 3,960 dam^3 (3,210 acre-feet) recorded at the Poplar River at International Boundary gauging station during the March 1 to May 31, 2002 period, Montana was entitled to an additional release of 370 dam^3 (300 acre-feet) from Cookson Reservoir during the succeeding twelve-month period commencing June 1, 2002. Montana requested this release to be made between May 1 and May 31, 2003. A volume of 386 dam^3 (313 acre-feet), in addition to the minimum flow, was delivered during this period. A hydrograph showing cumulative volume of the on-demand release request and on-demand release delivery made at the East Poplar River at International Boundary is shown in Figure 3.3

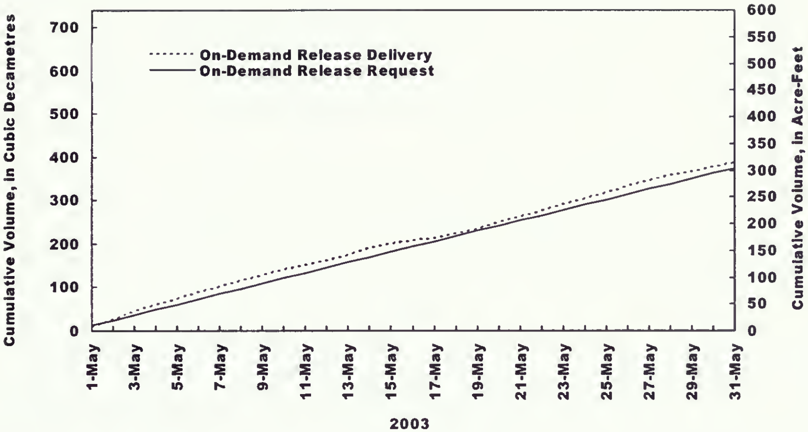


Figure 3.3 Cumulative Volume Hydrograph of On-Demand Release.

3.2.5 Surface-Water Quality

The 1981 report by the IJC to Governments recommended:

For the March to October period, the maximum flow-weighted concentrations should not exceed 3.5 milligrams per litre (mg/L) for boron and 1500 mg/L for TDS for any three consecutive months in the East Poplar River at the International Boundary. For the March to October period, the long-term average of flow-weighted concentrations should be 2.5 mg/L or less for boron, and 1000 mg/L or less for TDS in the East Poplar River at the International Boundary.

For the period prior to 1982, three-month moving flow-weighted concentration (FWC) for boron and total dissolved solids (TDS) was calculated solely from monthly monitoring results. Since the beginning of 1982, the USGS has monitored specific conductance daily in the East Poplar River at the International Boundary, making it possible to derive boron and TDS concentration using a linear regression relationship with specific conductance. Thus, the three-month FWC for boron and TDS for the period 1982 to 2003 was calculated from both the results of monthly monitoring (water-quality samples collected by both Canada and the United States) and the statistical analysis of daily specific

conductance readings collected by the USGS. During some years, estimated monthly water-quality sample data may be used in order to complete regression calculations of three-month and five-year flow-weighted concentrations. Estimated monthly water-quality samples are based upon concentration data from neighboring water-quality samples and specific-conductance data on the date of the missing water-quality sample (or date midway between neighboring water-quality samples).

The Bilateral Monitoring Committee adopted the approach that, for the purpose of comparison with the proposed IJC long-term objectives, the boron and TDS data are best plotted as a five-year moving FWC which is advanced one month at a time.

Prior to 1988, long-term averages were calculated for a five-year period in which 2.5 years preceded and 2.5 years followed each plotted point. Beginning in 1988, the FWC was calculated from the five-year period preceding each plotted point. For example, the FWC for December 2003 is calculated from data generated over the period December 1998 to December 2003. The calculations are based on the results of samples collected throughout the year, and are not restricted to only those collected during the months bracketing the period of irrigation (March to October) each year.

3.2.5.1 Total Dissolved Solids

TDS is inversely related to streamflow at the East Poplar River at the International Boundary station. During periods of high runoff such as spring freshet, TDS decreases as the proportion of streamflow derived from ground water decreases. Conversely, during times of low streamflow (late summer, winter) the contribution of ground water to streamflow is proportionally greater. Because ground water has a higher ionic strength than the surface water entering the river, the TDS of the stream increases markedly during low flow conditions.

Concerns over an upward trend in the concentrations of TDS in the East Poplar River between the late 1980's and 1995 were investigated in 2002. The results of the investigation indicated that the temporal changes in TDS concentrations were most likely primarily linked to natural drought events. Statistical analyses of discrete time periods showed no significant difference in TDS concentrations between the period 1976 to 1985, in which no trend was noted, and the period 1986 to 1995, in which an apparent

increasing trend was noted. Further, similar flow and concentration patterns were observed during this time period in the mainstem Poplar River, which is not as impacted by human influences and was used as a reference stream. Given that TDS concentrations have remained below the short-term objectives of the monitoring arrangement, no increasing concentration trends have been identified, and a surrogate water-quality measurement (specific conductance) can be used to estimate TDS, the Committee recommended that the current monthly water-quality sampling for TDS be reduced to four samples per year.

TDS water-quality sample data collected by Environment Canada and the USGS in 2003 are shown in Figure 3.4. The TDS concentrations ranged from 690 mg/L on March 25 to 1,054 mg/L on November 12. The proposed short-term objective for TDS is 1,500 mg/L. Monthly TDS water-quality sample data were missing and estimated for February, April, October, and December 2003.

The three-month moving FWC for TDS for the period of record is presented in Figure 3.5. The TDS objectives have not been exceeded during the period of record. On inspection of the plot in Figure 3.5, it is apparent that the three-month moving FWC increased gradually, year by year, up until the spring runoff of 1997, when an exceptionally heavy snowmelt contributed sufficient water of low ionic strength to the river and the reservoir to dilute the accumulated salts built up in the system. Dissolved-solids concentrations were lower in 2003 relative to those recorded in 2002; however, low spring runoff and higher contribution from ground water have kept the TDS level close to the long-term objective of 1,000 mg/L.

Figure 3.4: TDS Concentration for 2003 Water-Quality Samples from East Poplar River at the International Boundary

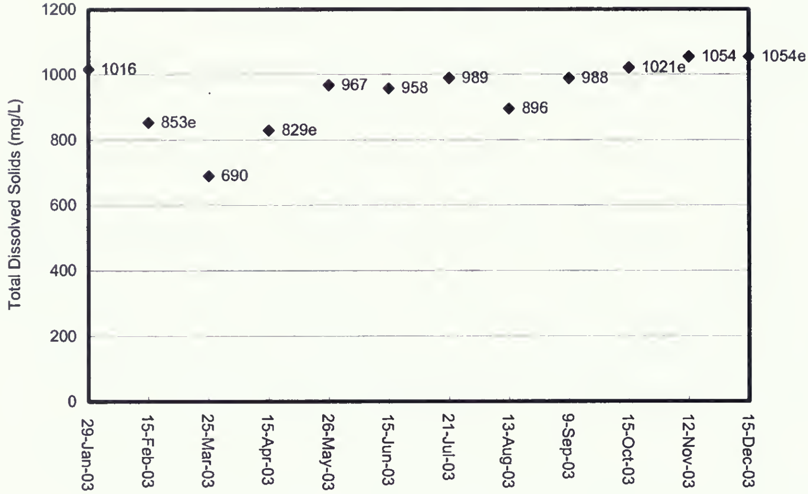
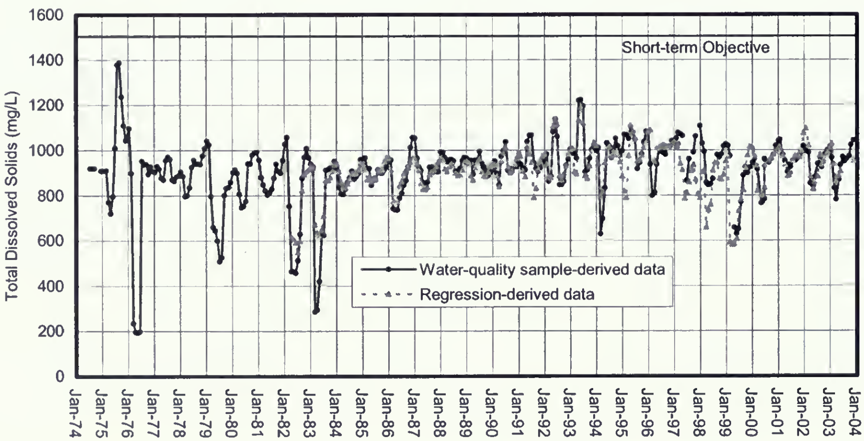


Figure 3.5: Three-Month Moving Flow-Weighted TDS Concentration in 2003 for East Poplar River at the International Boundary



The five-year moving FWC for TDS (Figure 3.6) did not exceed the long-term objective of 1,000 mg/L in 2003. The maximum monthly value calculated in 2003 was about 887 mg/L, which is slightly less than the previous year maximum monthly value of 943 mg/L.

The daily TDS values, as generated by linear regression from the daily specific-conductance readings, for the period January 1990 through December 2003 are shown in Figure 3.7. The data show an abrupt drop in TDS corresponding to the snowmelt runoff occurring during the spring of each year.

The relationship between TDS and specific conductance applied to data collected from 1974 to 2003 is as follows:

$$\textbf{TDS} = (0.62461 \times \textbf{specific conductance}) + 35.184$$
$$(R^2 = 0.84,\ n = 617)$$

Figure 3.6: Five-Year Moving Flow-Weighted TDS Concentration in 2003 for East Poplar River at the International Boundary

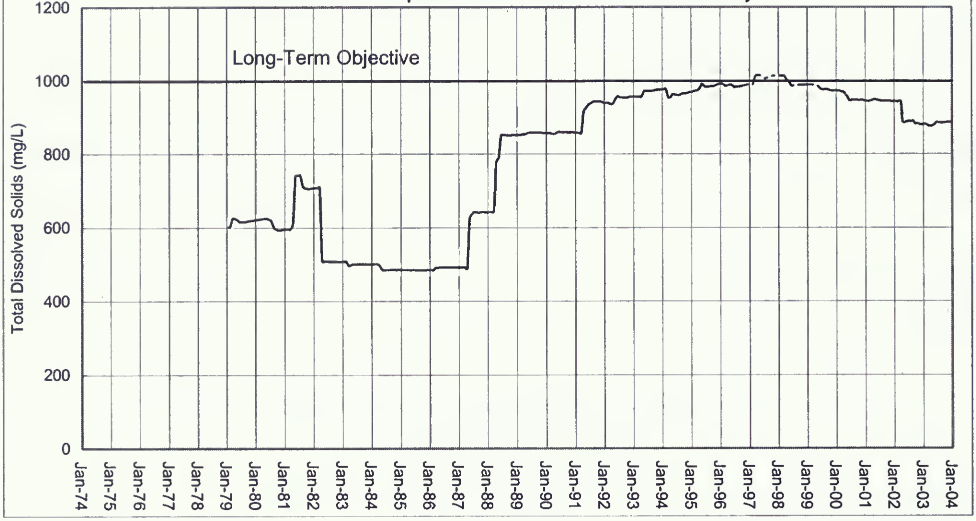
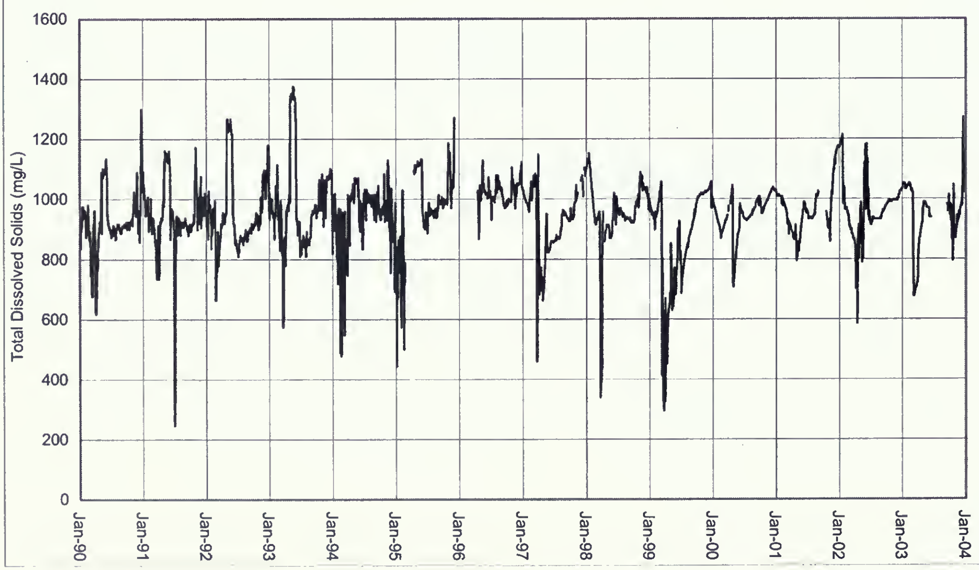


Figure 3.7: Daily TDS Concentration, 1990 to 2003; East Poplar River at the International Boundary (regression-derived data)



3.2.5.2 Boron

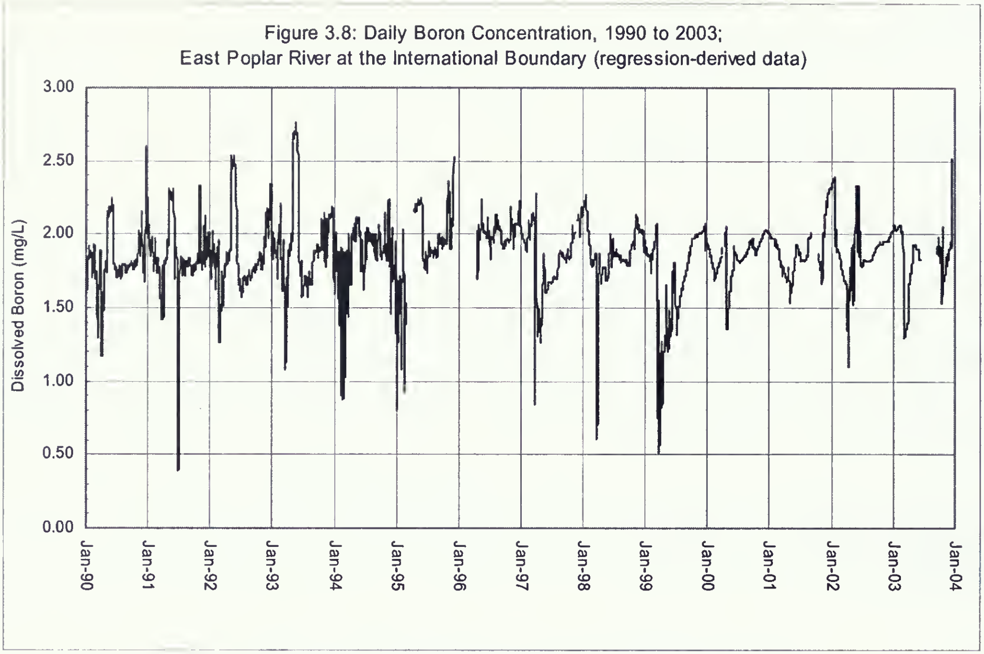
Boron water-quality sample data for 2003 at the East Poplar River at International Boundary was incomplete and no flow-weighted concentration analysis was conducted. In 2004, only four boron water-quality samples will be available for analysis.

Boron concentrations are not as well-correlated with specific conductance as TDS. Boron is a relatively minor ion, and does not in itself contribute to a large degree to the total load of dissolved constituents in the water. Accordingly, it appears likely that the standard deviation of dissolved boron (relative to the long-term mean boron concentration) may be greater than that of the major cations (sodium, potassium, and magnesium) and anions (sulphate, bicarbonate, and chloride) around their respective long-term mean concentrations.

The relationship between boron and specific conductance applied to data collected from 1974 to 2002 is as follows:

$$\textbf{Boron} = \textbf{(0.00129 x specific conductance) - 0.04709}$$
$$\mathbf{(R^2 = 0.57,\ n = 617)}$$

The daily boron values, as generated by linear regression, for the period January 1990 through December 2003 are shown in Figure 3.8.



3.2.5.3 Other Water-Quality Variables

Table 3.1 contains the multipurpose water-quality objectives for the East Poplar River at International Boundary, recommended by the International Poplar River Water Quality Board to the IJC. The table shows the number of samples collected for each parameter and the number of times over the course of the year that the objectives were exceeded. In the table, multiple replicate samples collected during the annual quality control exercise are treated as a single sample, but where an objective was exceeded in a replicate sample, this is charged against the single sample noted. As the table shows, all parameters were within the appropriate objectives.

Table 3.1 Recommended Water-Quality Objectives and Excursions, 2003 Sampling Program, East Poplar River at the International Boundary (units in mg/L, except as otherwise noted)

Parameter	Objective	No. of Samples		Excursions
		USA	Canada	
Objectives recommended by IJC to Governments				
Boron, dissolved	3.5/2.5 (1)	0	6	0
Total Dissolved Solids	1,500/1,000 (1)	4	6	0
Objectives recommended by Poplar River Bilateral Monitoring Committee to Governments				
Cadmium, total	0.0012	4	6	0
Fluoride, dissolved	1.5	4	6	0
Lead, total	0.03	4	6	0
Nitrate	10.0	4	6	0
Oxygen, dissolved	4.0/5.0 (2)	4	6	0
Sodium adsorption ratio	10.0	4	5	0
Sulphate, dissolved	800.0	4	6	0
Zinc, total	0.03	4	6	0
Water temperature (Celsius)	30.0 (3)	4	6	0
pH (pH units)	6.5 (4)	4	6	0

(1) Three-month average of flow-weighted concentrations should be <3.5 mg/L boron and <1,500 mg/L TDS. Five-year average of flow-weighted concentrations (March to October) should be <2.5 mg/L boron and <1,000 mg/L TDS.

(2) 5.0 (minimum April 10 to May 15), 4.0 (minimum, remainder of the year).

(3) Natural temperature (April 10 to May 15), <30 degrees Celsius (remainder of the year).

(4) Less than 0.5 pH units above natural, minimum pH = 6.5.

3.3 Ground Water

3.3.1 Operations

SaskPower's supplementary water supply project continued to operate during 2003. The supplementary water supply project currently consists of 21 wells with a total of 10 discharge points. No wells were added or deleted from the well field during the year. The majority of ground-water production in 2003 occurred during the fall to spring period. This is a typical operational pattern for the project and is done to minimize water losses. However, pumping was maintained through the 2003 summer period due to low spring runoff. In 2003, ground-water production decreased to 4,489 dam^3 from the 2002 total of 4,927 dam^3 total. Production from 1991 to 2003 has now averaged 4,998 dam^3 per year. Prior to 1991, the wells used for supplementary supply were part of a dewatering network for coal-mining operations. This resulted in the high production levels experienced in the early to mid 1980's. With the drought of the late 1980's and early 1990's, it was evident that there was a continued need for ground water to supplement water levels in Cookson Reservoir. Consequently, the wells were taken over by SaskPower for use as a supplementary supply.

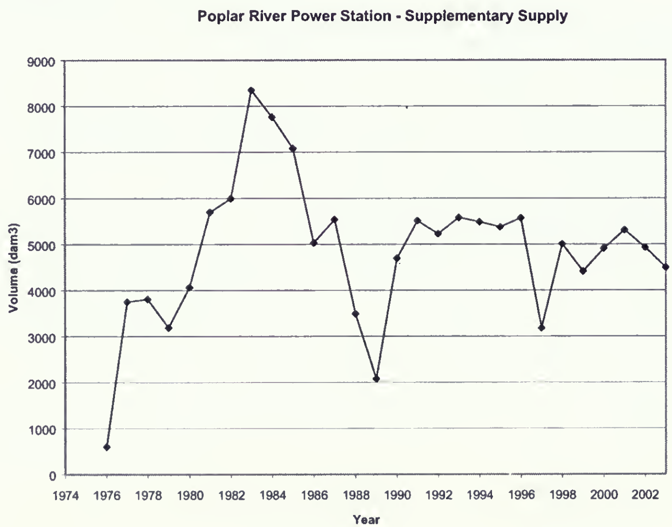


Figure 3.9 Supplementary Water Supply

SaskPower has an approval for the supplementary supply project to produce an annual volume of 5,500 dam^3/year. This approval was extended by Sask Water in 1996. Future revisions to the approval will likely include conditions requiring termination of pumping (with the exception of wells supplying domestic users) when the reservoir is above a specified level.

In addition to the supplementary supply, SaskPower also operates the Soil Salinity Project, which is located south of Morrison Dam. The project was initiated in 1989 to alleviate soil salinity which had developed below the dam. The salinity project consists of a network of production wells which discharge into the cooling water canal, which in turn discharges to Cookson Reservoir. Operation of the salinity project continued in 2003 despite ongoing operational difficulties which resulted in a continued decline in the annual volume pumped. As a result, only 426 dam^3 of ground water was pumped from the Soil Salinity Project in 2003. This was much lower than the 2002 production level of 631 dam^3, and substantially lower than the average annual production obtained in the early to mid-1990's when production was near its optimal level. Production levels peaked at about 1,100 dam^3/year in 1994. SaskPower expects to increase production levels in 2004 with additional rehabilitation work.

Well PW87104, which is located on the east side of the river, provided all the production in 2003.

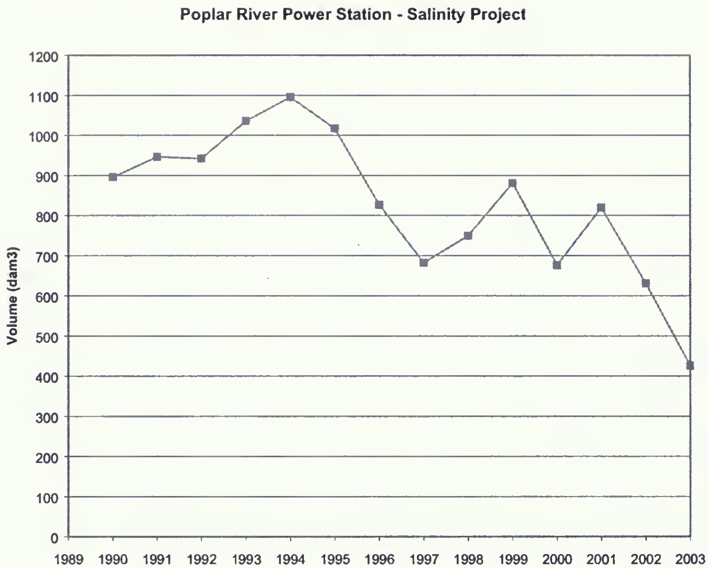


Figure 3.10 Pumpage from Salinity Control Project

3.3.2 Ground-Water Monitoring

Equivalent geologic formations present in Saskatchewan and Montana have different names. A list of the corresponding formation names is provided in Table 3.2.

Table 3.2 Geologic Formation Name Equivalence between Saskatchewan and Montana

Formation Location	Geologic Formation Name			
Saskatchewan	Eastend to Whitemud	Frenchman	Ravenscrag	Alluvium
Montana	Fox Hills	Hell Creek	Fort Union	Alluvium

3.3.2.1 Saskatchewan

In 2003, SaskPower reduced its monitoring network from 180 piezometers to about 85 piezometers after receiving approval from Saskatchewan Environment. This reduction was based on modelling studies undertaken by SaskPower.

In past years the groundwater response to pumping has been illustrated through a regional drawdown map prepared by SaskPower. However, the 2003 drawdown map indicated an apparent expansion in the cone of depression in the vicinity of the International Boundary during 2003. Given that the 2003 withdrawals were the lowest in the past four years, and one of the lowest in the past 13 years, the apparent expansion was anomalous. This was confirmed by the absence of any significant increases in drawdown in Montana's monitoring wells (Figure 3.13). It was therefore decided to incorporate hydrographs for several monitoring wells near the border as opposed to the drawdown map. Hydrographs of these selected wells are shown in Figures 3.11 and 3.12. While there are some anomalous data points in the hydrographs, they do clearly show that there have not been significant changes in groundwater levels in the Hart Coal seam at the international boundary in the past ten years. Of particular note are monitoring wells M811 and M507 along the international boundary.

The goal of the Salinity Control Project is to lower ground-water levels in the Empress sands below Morrison Dam to approximately pre-reservoir levels. This is equivalent to roughly two to three metres of drawdown, and was achieved by the end of 1995 and again by the end of 1996. However, reduced production over the past several years and increased recharge from higher reservoir levels and precipitation has led to a significant contraction in the project's cone of depression with the cone of depression being negligible at the end of 2003.

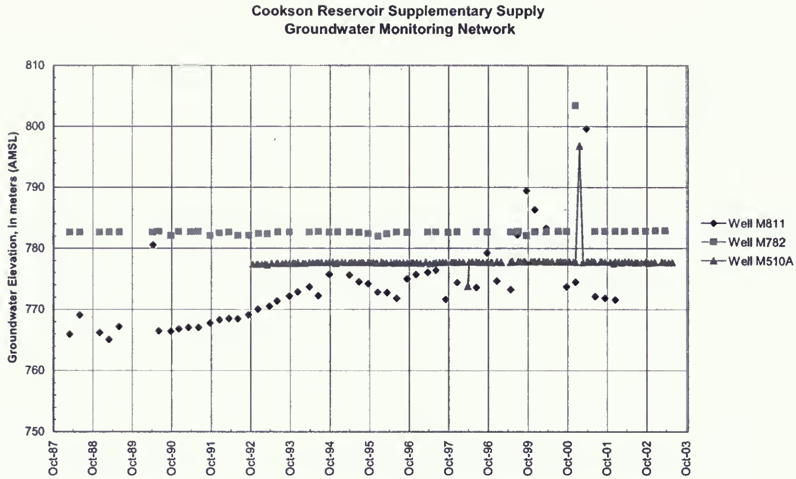


Figure 3.11 Hydrograph of Selected Wells—Cookson Reservoir Supplementary Supply

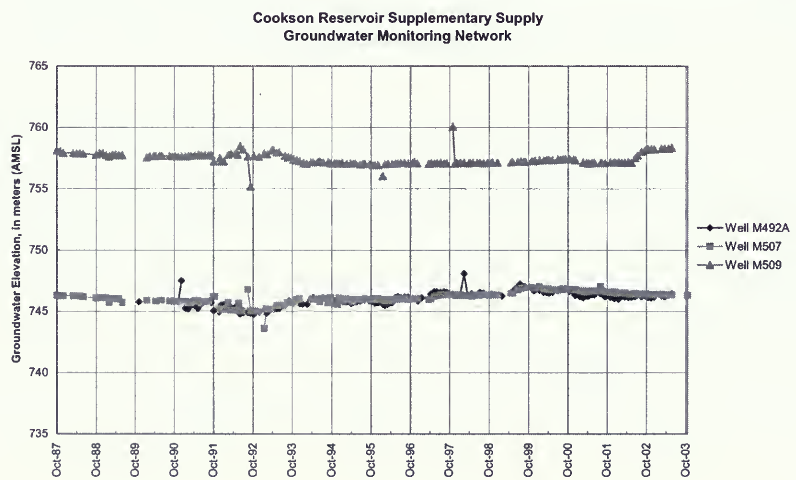


Figure 3.12 Hydrograph of Selected Wells—Cookson Reservoir Supplementary Supply

3.3.2.2 Montana

Water-levels in monitoring wells (6, 7, 9, 13, 16, 17, 19, and 22) that penetrate the Fort Union Formation and/or Hart Coal Seam were rising during 1997 and 1998, and have leveled off or decreased during the last five years (1999 to 2003). Hydrographs of selected Fort Union and Hart Coal Seam wells (6, 7, 17, and 19) are shown in figure 3.13.

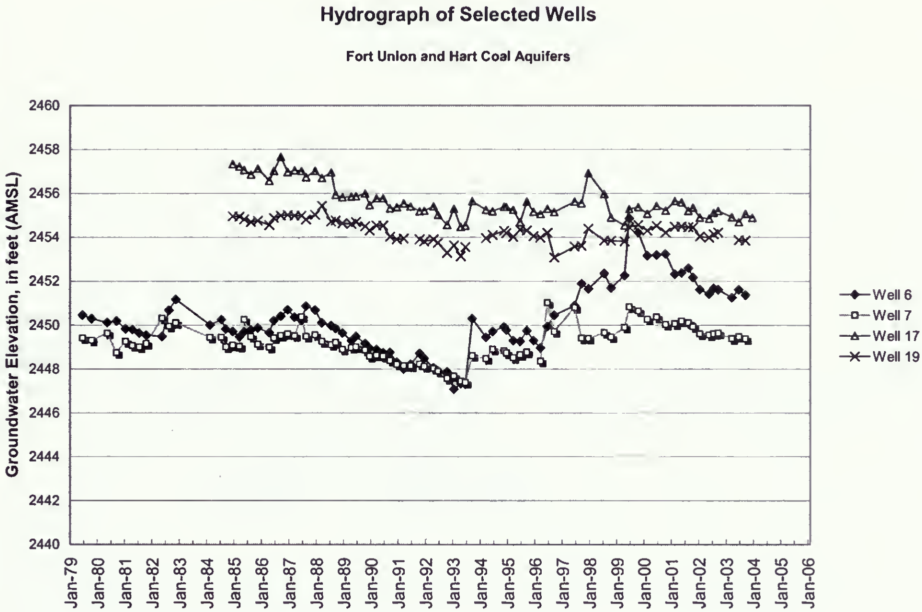


Figure 3.13 Hydrograph of Selected Wells—Fort Union and Hart Coal Aquifers

The potentiometric surface in the Fox Hills/Hell Creek artesian aquifer (well 11) has shown very little fluctuation or change throughout the 25-year (1979-2003) monitoring period.

Water levels in monitoring wells (5, 8, 10, 23, and 24) that penetrate the alluvial and/or outwash aquifer show considerable fluctuation due to seasonal and/or pumping changes. Hydrographs of selected alluvial wells (10, 23, and 24) and the Fox Hills well (11) are shown in Figure 3.14.

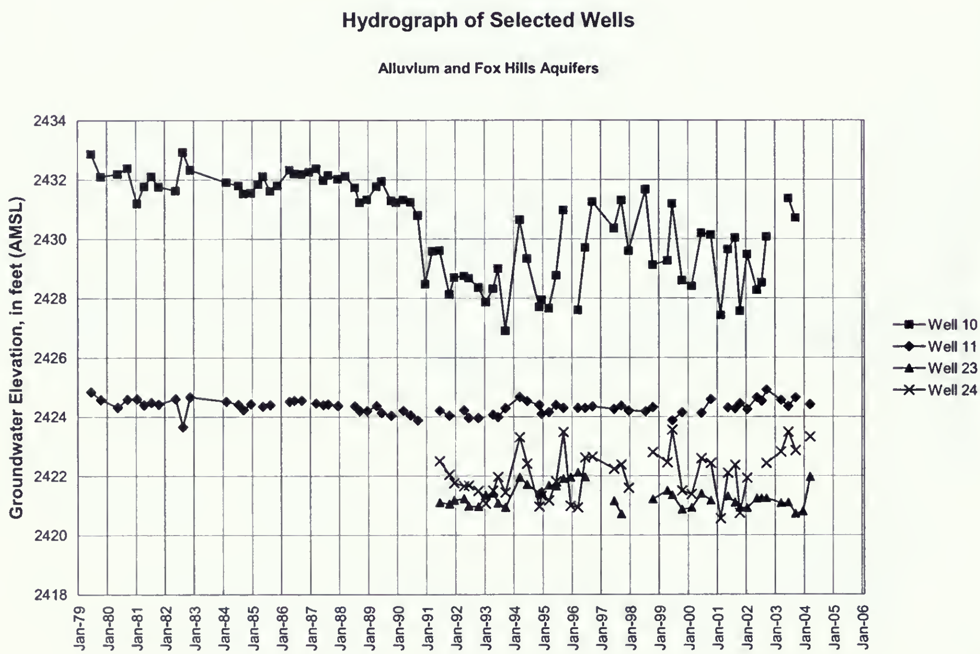


Figure 3.14 Hydrograph of Selected Wells—Alluvium and Fox Hills Aquifers

3.3.3 Ground-Water Quality

3.3.3.1 Saskatchewan

The water quality from the Supplementary Supply Project discharge points has been consistent with no trends indicated. A summary of the more frequently tested parameters during 2003 is provided in Table 3.3. Statistical averages of the results since 1992 are included in this table.

Table 3.3 Water-Quality Statistics for Water Pumped from Supplementary Water Supply Project Wells*

	2003 Average	1992 - 2003 Average
pH (unit)	8.1	8.0
Conductivity (µS/cm)	1,387	1,316
Total Dissolved Solids	945	910
Total Suspended Solids	26	10.9
Boron	1.2	1.2
Sodium	191	179
Cyanide (µg/L)	<0.004	<2
Iron	0.17	0.2
Manganese	0.09	0.1
Mercury (µg/L)	<0.05	<0.1
Calcium	68.7	72
Magnesium	48.2	52
Sulfate	271	269
Nitrate	0.01	0.07

*All units in mg/L, unless otherwise noted. Sampled at Site "C3" on Girard Creek.

Average water-quality results from the common discharge point for the Salinity Control Project for 2003, plus an average of the 1992-2003 results, are provided in Table 3.4. Results have remained relatively consistent since 1992.

Table 3.4 Water-Quality Statistics for Water Pumped from Salinity Control Project Wells Sampled at the Discharge Pipe*

	2003 Average	1992-2003 Average
pH (units)	7.8	7.5
Conductivity (µS/cm)	1,479	1,410
Total Dissolved Solids	1,050	981
Boron	1.5	1.6
Calcium	121	103
Magnesium	65	60
Sodium	145	146
Potassium	7.4	7.4
Arsenic (µg/L)	7.0	8.1
Aluminum	<0.1	0.1
Barium	<0.1	<0.1
Cadmium	<0.01	<0.003
Iron	4.0	4.1
Manganese	0.10	0.136
Molybdenum	<0.1	<0.01
Strontium	1.8	1.8
Vanadium	<0.1	<0.1
Uranium (µg/L)	<0.5	<0.2
Mercury (µg/L)	<0.05	0.08
Sulfate	362	314
Chloride	6.6	6.2
Nitrate	<0.003	<1.04

*All concentrations in mg/L, unless otherwise noted.

Ground-water quality in the vicinity of the ash lagoons can potentially be affected by leachate movement through the ash lagoon liner systems. The piezometers listed in the Technical Monitoring Schedules are used to assess leachate movement and calculate seepage rates. Piezometric water level, boron, and chloride are the chosen indicator parameters to assess leachate movement.

The ground-water monitoring program was expanded in 1994 as a result of Ash Lagoon No. 3 South construction. In total, 20 new pneumatic piezometers and 28 new standpipe piezometers were completed within their target zones. Testing of these piezometers began in 1995. The limited data so far do not show any unusual or unexpected values.

Piezometers C867A, C868A and C871A are completed immediately above the liner system, within the ash stack of Ash Lagoon No. 1. The 2003 monitoring results continue to suggest confirmation of the trend first observed in 1993 that the boron concentration decreases with depth within the ash stack. The effect of ash thickness on leachate quality is, however, not completely understood.

The chemistry of water immediately above the liner systems is therefore expected to differ from the surface water of the lagoons. Meaningful information is only available from piezometers installed within Ash Lagoon No. 1 where ash has been deposited for many years. The 2003 monitoring results of Ash Lagoon No. 3 South piezometers completed above the liner system (piezometers C886A, C887A, C890A and C893A) supports the theory that boron levels decrease with depth within the ash stacks. Future monitoring of all piezometers completed above the lagoon liner systems will continue with the purpose of confirming the boron trend noted above and to improve the understanding of leachate quality and flow from the ash lagoons.

The piezometric surface measurements for the oxidized till continue to show the presence of a ground-water mound beneath the ash lagoons. The mound extends from the west side of the Polishing Pond to the east side of Ash Lagoon No. 2. Isolated ground-water mounds have developed within the area of the oxidized ground-water mound. Piezometers located in the oxidized till suggest limited leachate activity. No seepage activity is evident in the unoxidized till.

The greatest changes in chloride and boron concentrations within the oxidized till have occurred where piezometric levels have changed the most. Although increasing water levels do not automatically suggest that the water affecting the piezometers is leachate, changing piezometric levels do suggest ground-water movement. Oxidized till piezometers C868B and C869B located in the middle of the lagoons, between Ash Lagoon No. 1 and No. 2, have shown increased piezometric levels but chemical information does not indicate leachate influence. On the west side of the Polishing Pond, the boron levels have changed only slightly in the oxidized till piezometers C728A and C728D, where the chloride levels have changed more significantly. The chloride level for C728A has decreased from 403 mg/L in 1983 to 197 mg/L in 2003. The chloride level for C728D has increased from 185 mg/L in 1983 to 342 mg/L in 2003. Although these piezometers are close in proximity and installed at the same level, they are being influenced by different water. Chloride results for C728A suggest initial seepage and it is to be expected that over time the same observation will be seen in C728D.

The piezometric surface of the Empress Gravel indicates a regional flow from northwest to southeast below Morrison Dam. As a general observation, Empress piezometers respond to changing reservoir levels. Results for the Empress layer do not indicate seepage activity with the majority of the analyses showing little real change in boron or chloride results.

Sand lens piezometers C712B, C766 and C767 are located between the Polishing Pond and the cooling water canal. C767 is located on the top of dyke G and C766 and C712B are located at the toe of dyke G. These piezometers have historically been of interest as the sand lens provides a preferential pathway for leachate migration of boron concentrations. C766 shows an increasing trend up to October 1988 with a peak of 43.0 mg/L in April 1995. Since 1995 the boron levels have declined modestly and have remained between 25 and 38 mg/L.

Up to April 1988 the boron concentration for C767 was increasing and peaked at 49.4 mg/L. Since this peak the boron concentration steadily decreased to the end of 1991 where it leveled off near 5 mg/L and has since remained with one exception, a concentration of 11.7 mg/L in October 2000.

Piezometer C712B has been monitored for several years. Historically, boron levels were below 1 mg/L. From 1992 to 2003, boron levels have remained relatively steady around between 12 and 20 mg/L.

3.3.3.2 Montana

Samples were collected from monitoring wells 7, 16, and 24 during 2003. Well 7 is completed in Hart Coal, well 16 is completed in the Fort Union Formation, and well 24 is completed in alluvium. The TDS concentration in water from all three monitoring wells decreased in 2003. Changes in TDS with time for wells 7, 16, and 24 are shown in Figure 3.15.

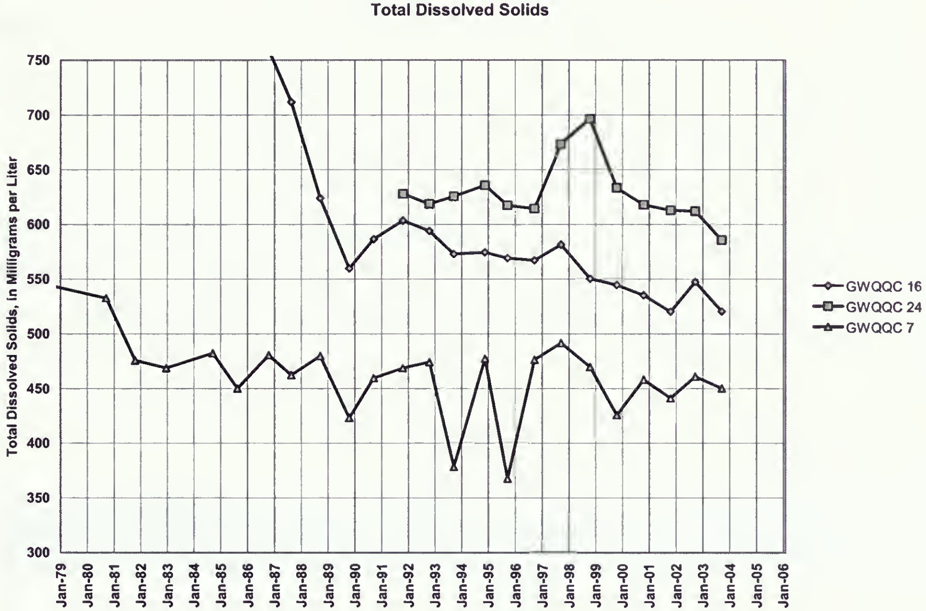


Figure 3.15 Total Dissolved Solids in Samples from Montana Wells.

3.4 Cookson Reservoir

3.4.1 Storage

On January 1, 2003, Cookson Reservoir storage was 31,320 dam^3 or 72% of the full supply volume. The 2003 maximum, minimum, and period elevations and volumes are shown in Table 3.5.

Inflows into the reservoir were near normal in 2003. A release was initiated in May to meet the recommended Poplar River basin demand release for the 2002-2003 apportionment years. No releases were required to maintain the recommended apportionment target flow at the International Boundary for the remainder of the year.

In addition to runoff, reservoir levels were augmented by ground-water pumping. Wells in the abandoned west block mine site supplied 4,489 dam^3 to Girard Creek. It is estimated that approximately 70% of this flow volume reached Cookson Reservoir. Wells in the soil salinity project area supplied 426 dam^3.

Table 3.5 Cookson Reservoir Storage Statistics for 2003

Date	Elevation (m)	Contents (dam^3)
January 1	751.31	31,320
May 17 (Maximum)	752.28	37,990
October 27 (Minimum)	751.11	30,770
December 31	751.26	31,010
Full Supply Level	753.00	43,410

The Poplar River Power Station is dependent on water from Cookson Reservoir for cooling. Power plant operation is not adversely affected until reservoir levels drop below 749.0 metres. The dead storage level for cooling water used in the generation process is 745.0 metres. The 2003 recorded levels and associated operating levels are shown in Figure 3.16.

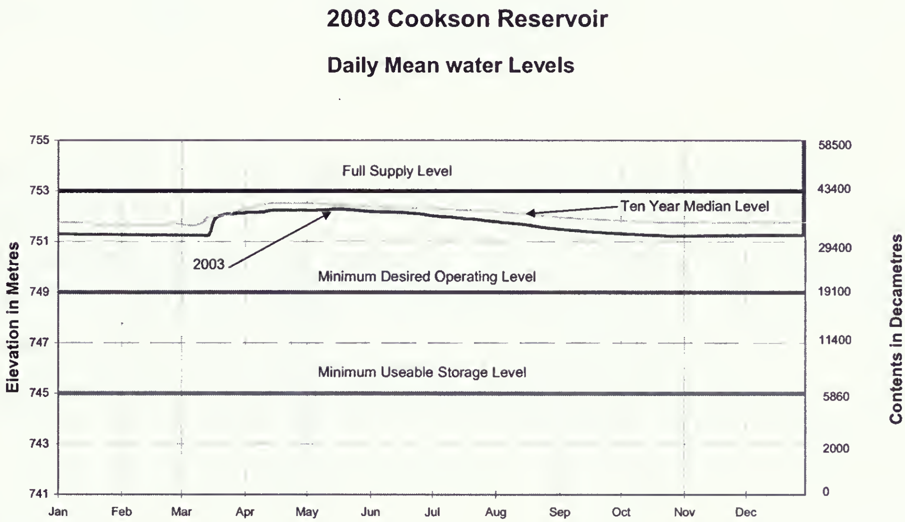


Figure 3.16 Cookson Reservoir Daily Mean Water Levels for 2003 and Median Daily Water Levels, 1993-2002

3.4.2 Water Quality

The period from 1987 to 1993 saw very low volumes of surface-water runoff to Cookson Reservoir. Consequently, total dissolved solids (TDS) in the reservoir increased steadily from approximately 780 mg/L to over 1,800 mg/L. Since 1993, higher runoff volumes have improved reservoir water quality. Since 1997, the TDS levels in the reservoir have generally remained below 1,000 mg/L. The average TDS level in Cookson Reservoir in 2003 was 928 mg/L, up slightly from the 2002 average level of 910 mg/L but still below past levels.

3.5 Air Quality

SaskPower's ambient SO_2 monitoring for 2003 recorded no values greater than Saskatchewan Environment's one-hour average standard of 0.17 ppm and the 24-hour average standard of 0.06 ppm. The ambient SO_2 monitor was replaced in January 2001 which has greatly improved the availability of this information. The 2003 geometric mean for the high-volume suspended-particulate sampler was 17.6 $\mu g/m^3$ and 2003 was the twelfth consecutive year of below-average particulate readings. One total suspended-particulate concentration exceeded the Saskatchewan provincial standard of 120 $\mu g/m^3/24$ hours in 2003. This occurred when a reading of 187.4 $\mu g/m^3/24$ hours was taken on October 24, 2003.

3.6 Quality Control

3.6.1 Streamflow

Current-meter discharge measurements were made at the East Poplar River at International Boundary site on August 6, 2003 by personnel from the U.S. Geological Survey (USGS) and Environment Canada (EC) to confirm streamflow measurement comparability. Data from the two current-meter discharge measurements are shown in Table 3.6. The measured discharges compared well with each other and the theoretical discharge computation of 0.053 m^3/s for a 90° V-notch weir.

Table 3.6 Streamflow Measurement Results for August 6, 2003

Agency	Time CST	Width (m)	Mean Area (m^2)	Velocity (m/s)	Gauge Height (m)	Discharge (m^3/s)
EC	1030	1.3	0.140	0.346	1.579	0.049
USGS	1030	1.2	0.131	0.405	1.579	0.053

3.6.2 Water Quality

Quality-control sampling was carried out at the East Poplar River at International Boundary on September 9, 2003. Participating agencies included the U.S. Geological Survey, Environment Canada, and SaskPower.

Sets of triplicate samples were split from USGS sampling churns and submitted to the respective agency laboratories for analyses. Field procedures were identical to those used since 1986. Sample results are shown in Table 3.7.

Table 3.7 East Poplar River Joint Water-Quality Sample Results for September 9, 2003

AGENCY	ENVIRONMENT CANADA			USGS			SASKPOWER		
Time (CST)	1245	1300	1315	1245	1300	1315	1245	1300	1315
Parameters recommended by IJC to Governments									
Boron, diss., mg/L	2.69	2.71	2.75	--	--	--	--	--	--
Total diss. solids, mg/L	986	988	992	952	934	940	957	951	957
Parameters recommended by Poplar River Bilateral Monitoring Committee to Governments									
Cadmium, total, mg/L	0.00015	0.00014	0.00023	<.0004	<.0004	<.0004	<0.01	<0.01	<0.01
Fluoride, diss., mg/L	0.13	0.13	0.13	0.4	0.3	0.4	0.3	0.3	0.3
Lead, total, mg/L	0.000234	0.000265	0.00025	0.00038	0.00052	0.00042	<0.1	<0.1	<0.1
Nitrate, diss. (as N), mg/L	<0.01	<0.01	<0.01	<0.022	<0.022	<0.022	<0.003	<0.003	<0.003
Oxygen, diss., mg/L	6.18			8.2			7.3		
Sodium adsorption ratio	5.59	5.33	5.59	5	5	5	--	--	--
Sulphate, diss., mg/L	310	310	313	296	295	299	306	296	301
Zinc, total, mg/L	.00126	.00104	.00109	.002	.002	.002	<0.1	<0.1	<0.1
Temperature, water, deg. C	18.5			18.5			18.5		
pH, field, standard units	8.33			8.4			8.33		
Conductivity, field, µS/cm	1,406			1,490			1,487		
Conductivity, lab, µS/cm	1,460			1,410			1,440		

ANNEX 1

POPLAR RIVER

COOPERATIVE MONITORING ARRANGEMENT

CANADA-UNITED STATES

September 23, 1980

POPLAR RIVER COOPERATIVE MONITORING ARRANGEMENT

I. PURPOSE

This Arrangement will provide for the exchange of data collected as described in the attached Technical Monitoring Schedules in water-quality, water quantity and air quality monitoring programs being conducted in Canada and the United States at or near the International Boundary in response to SaskPower development. This Arrangement will also provide for the dissemination of the data in each country and will assure its comparability and assist in its technical interpretation.

The Arrangement will replace and expand upon the quarterly information exchange program instituted between Canada and the United States in 1976.

II. PARTICIPATING GOVERNMENTS

Governments and government agencies participating in the Arrangement are:

Government of Canada: Environment Canada
Government of the Province of Saskatchewan:
Saskatchewan Environment and Resource Management
Government of the United States of America: United States Geological Survey
Government of the State of Montana: Executive Office

III. POPLAR RIVER MONITORING COMMITTEE: TERMS OF REFERENCE

A binational committee called the Poplar River Bilateral Monitoring Committee will be established to carry out responsibilities assigned to it under this Arrangement. The Committee will operate in accordance with the following terms of reference:

A. Membership

The Committee will be composed of four representatives, one from each of the participating Governments. It will be jointly chaired by the Government of Canada and the Government of the United States. There will be a Canadian Section and a United States Section. The participating Governments will notify each other of any changes in membership on the Committee. Co-chairpersons may by mutual agreement invite agency technical experts to participate in the work of the Committee.

The Governor of the State of Montana may also appoint a chief elective official of local government to participate as an ex-officio member of the Committee in its technical deliberations. The Saskatchewan Minister of the Environment may also appoint a similar local representative.

B. Functions of the Committee

The role of the Committee will be to fulfil the purpose of the Arrangement by ensuring the exchange of monitored data in accordance with the attached Technical Monitoring Schedules, and its collation and technical interpretation in reports to Governments on implementation of the Arrangement. In addition, the Committee will review the existing monitoring systems to ensure their adequacy and may recommend to the Canadian and United States Governments any modifications to improve the Technical Monitoring Schedules.

1. Information Exchange

Each Co-chairperson will be responsible for transmitting to his counterpart Co-chairperson on a regular, and not less than quarterly basis, the data provided by the cooperative monitoring agencies in accordance with the Technical Monitoring Schedules.

2. Reports

(a) The Committee will prepare a joint Annual Report to the participating governments, and may at any time prepare joint Special Reports.

(b) Annual Reports will

i) summarize the main activities of the Committee in the year under Report and the data which has been exchanged under the Arrangement;

ii) draw to the attention of the participating governments any definitive changes in the monitored parameters, based on collation and technical interpretation of exchanged data (i.e. the utilization of summary, statistical and other appropriate techniques);

iii) draw to the attention of the participating governments any recommendations regarding the adequacy or redundancy of any scheduled monitoring operations and any proposals regarding modifications to the Technical Monitoring Schedules, based on a continuing review of the monitoring programs including analytical methods to ensure their comparability.

(c) Special Reports may, at any time, draw to the attention of participating governments definitive changes in monitored parameters which may require immediate attention.

(d) Preparation of Reports

Reports will be prepared following consultation with all committee members and will be signed by all Committee members. Reports will be separately forwarded by the Committee Co-chairmen to the participating governments. All annual and special reports will be so distributed.

3. Activities of Canadian and United States Sections

The Canadian and United States section will be separately responsible for:

(a) dissemination of information within their respective countries, and the arrangement of any discussion required with local elected officials;

(b) verification that monitoring operations are being carried out in accordance with the Technical Monitoring Schedules by cooperating monitoring agencies;

(c) receipt and collation of monitored data generated by the cooperating monitoring agencies in their respective countries as specified in the Technical Monitoring Schedules;

(d) if necessary, drawing to the attention of the appropriate government in their respective countries any failure to comply with a scheduled monitoring function on the part of any cooperating agency under the jurisdiction of that government, and requesting that appropriate corrective action be taken.

IV. PROVISION OF DATA

In order to ensure that the Committee is able to carry out the terms of this Arrangement, the participating governments will use their best efforts to have cooperating monitoring agencies, in their respective jurisdictions provide on an ongoing basis all scheduled monitored data for which they are responsible.

V. TERMS OF THE ARRANGEMENT

The Arrangement will be effective for an initial term of five years and may be amended by agreement of the participating governments. It will be subject to review at the end of the initial term and will be renewed thereafter for as long as it is required by the participating governments.

ANNEX 2

POPLAR RIVER

COOPERATIVE MONITORING ARRANGEMENT

TECHNICAL MONITORING SCHEDULES

2004

CANADA-UNITED STATES

TABLE OF CONTENTS

PREAMBLE

The Technical Monitoring Schedule lists those water quantity, water-quality and air quality monitoring locations and parameters which form the basis for information exchange and reporting to Governments. The structure of the Committee responsible for ensuring the exchange takes place is described in the Poplar River Cooperative Monitoring Arrangement.

The monitoring locations and parameters listed herein have been reviewed by the Poplar River Bilateral Monitoring Committee and represent the basic technical information needed to identify any definitive changes in water quantity, water-quality and air quality at the International Boundary. The Schedule was initially submitted to Governments for approval as an attachment to the 1981 report to Governments. Changes in the sampling locations and parameters may be made by Governments based on the recommendations of the Committee.

Significant additional information is being collected by agencies on both sides of the International Boundary, primarily for project management or basin-wide baseline data purposes. This additional information is usually available upon request from the collecting agency and forms part of the pool of technical information which may be drawn upon by Governments for specific study purposes. Examples of additional information are water quantity, water-quality, ground-water and air quality data collected at points in the Poplar River basin not of direct concern to the Committee. In addition, supplemental information on parameters such as vegetation, soils, fish and waterfowl populations and aquatic vegetation has been collected on either a routine or specific studies basis by various agencies.

POPLAR RIVER

COOPERATIVE MONITORING ARRANGEMENT

TECHNICAL MONITORING SCHEDULES

2004

CANADA

STREAMFLOW MONITORING

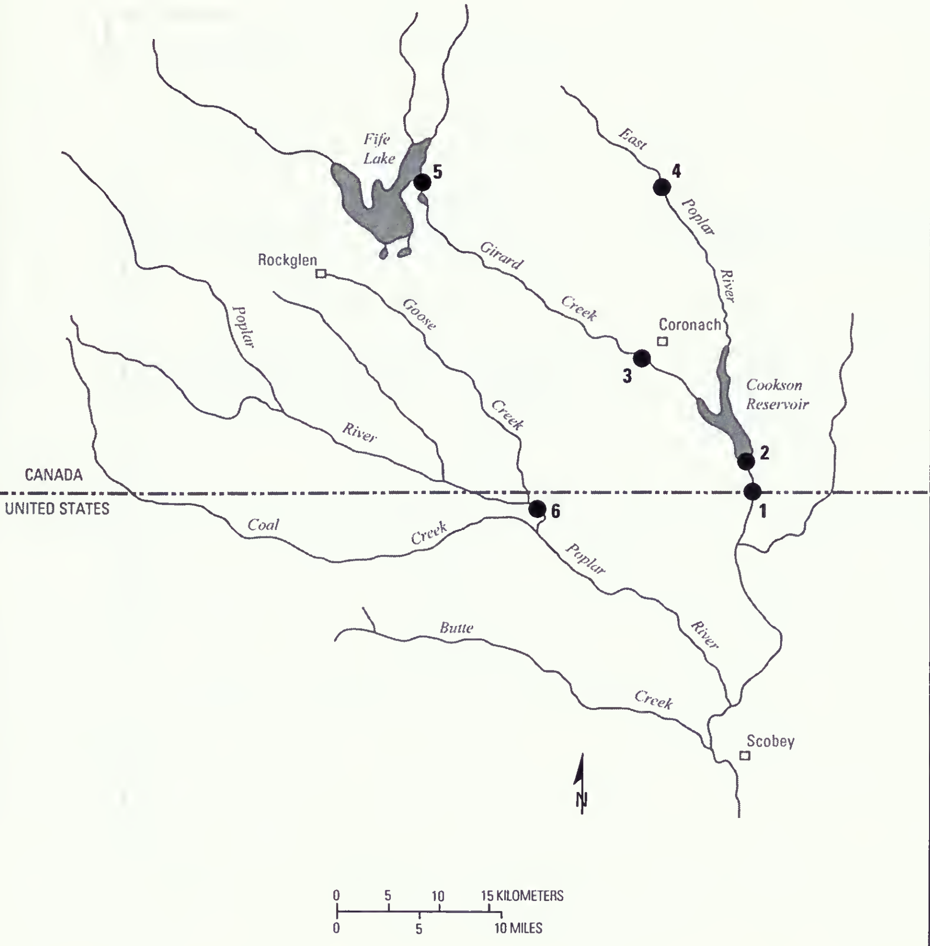
Daily mean discharge or levels and instantaneous monthly extremes as normally published in surface water data publications.

Responsible Agencies: Environment Canada; Saskatchewan Watershed Authority		
No. on Map	**Station No.**	**Station Name**
1*	11AE003 (06178500)	East Poplar River at International Boundary
2	11AE013***	Cookson Reservoir near Coronach
3	11AE015***	Girard Creek near Coronach Cookson Reservoir
4	11AE014***	East Poplar River above Cookson Reservoir
5		Fife Lake Overflow**
6*	11AE008 (06178000)	Poplar River at International Boundary

* - International gauging station

** - Miscellaneous measurements of outflow to be made by Saskatchewan Watershed Authority (SWA) during periods of outflow only.

*** - SWA took over the monitoring responsibility effective July 1/92.



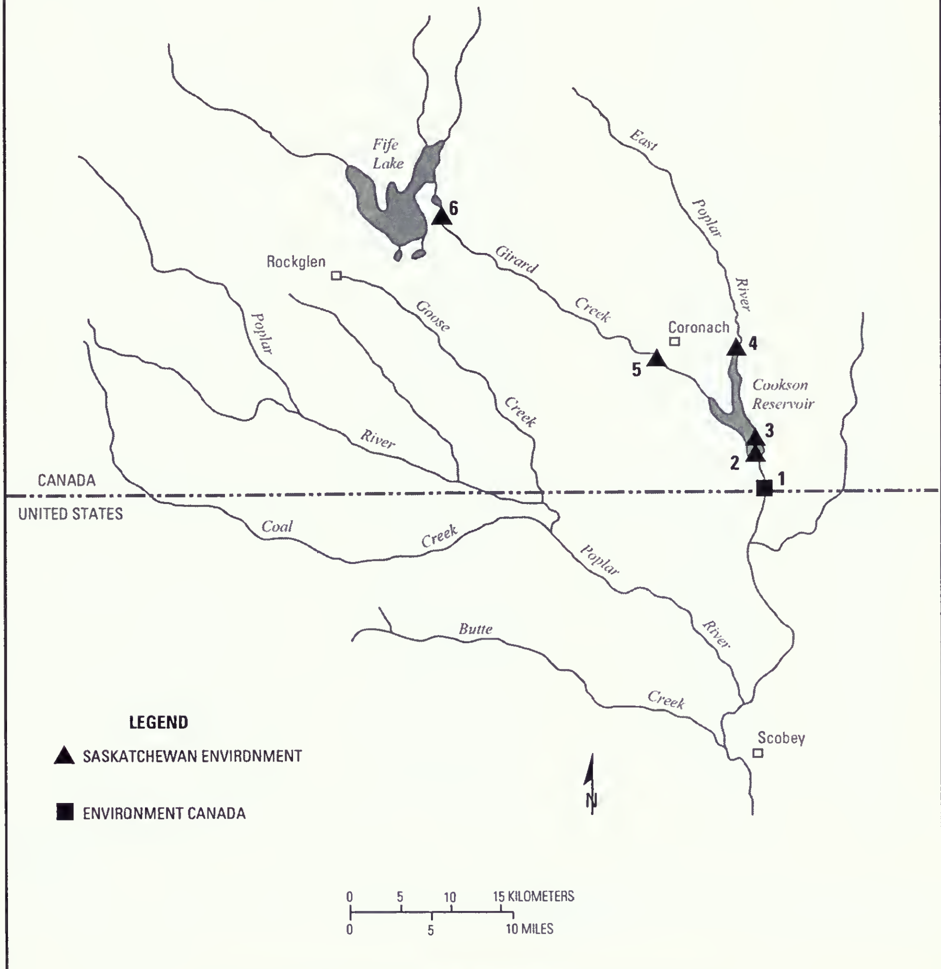
HYDROMETRIC GAUGING STATIONS (CANADA)

SURFACE-WATER-QUALITY MONITORING

Sampling Locations

Responsible Agency: Environment Canada		
No. on Map	**Station No.**	**Station Name**
1	00SA11AE0008	East Poplar River at International Boundary

Responsible Agency: Saskatchewan Environment Data collected by: Sask Power		
No. on Map	**Station No.**	**Station Name**
2	12386 Discontinued	East Poplar River at Culvert Immediately below Cookson Reservoir
3	12368	Cookson Reservoir near Dam
4	12377 Discontinued	Upper End of Cookson Reservoir at Highway 36
5	12412 Discontinued	Girard Creek at Coronach, Reservoir Outflow
6	7904	Fife Lake Outflow



SURFACE-WATER-QUALITY MONITORING STATIONS (CANADA)

PARAMETERS

Responsible Agency: Environment Canada			
ENVIRODAT* Code	Parameter	Analytical Method	Sampling Frequency Station No. 1
10151	Alkalinity-phenolphthalein	Potentiometric Titration	SUS
10111	Alkalinity-total	Potentiometric Titration	SUS
13102	Aluminum-dissolved	AA-Direct	SUS
13302	Aluminum-extracted	AA-Direct	SUS
07540	Ammonia-total	Automated Colourimetric	SUS
33108	Arsenic-dissolved	ICAP-hydride	SUS
56001	Barium-total	AA-Direct	SUS
06201	Bicarbonates	Calculated	SUS
05211	Boron-dissolved	ICAP	SUS
96360	Bromoxynil	Gas Chromatography	SUS
48002	Cadmium-total	AA Solvent Extraction	SUS
20103	Calcium	AA-Direct	SUS
06104	Carbon-dissolved organic	Automated IR Detection	SUS
06901	Carbon-particulate	Elemental Analyzer	SUS
06002	Carbon-total organic	Calculated	SUS
06301	Carbonates	Calculated	SUS
17206	Chloride	Automated Colourimetric	SUS
06717	Chlorophyll a	Spectrophotometric	SUS
24003	Chromium-total	AA-Solvent Extraction	SUS
27002	Cobalt-total	AA-Solvent Extraction	SUS
36012	Coliform-fecal	Membrane Filtration	SUS
36002	Coliform-total	Membrane Filtration	SUS
02021	Colour	Comparator	SUS
02041	Conductivity	Wheatstone Bridge	SUS
06610	Cyanide	Automated UV-Colourimetric	SUS
09117	Fluoride-dissolved	Electrometric	SUS
06401	Free Carbon Dioxide	Calculated	SUS
10602	Hardness	Calculated	SUS
17811	Hexachlorobenzene	Gas Chromatography	SUS
08501	Hydroxide	Calculated	SUS
26104	Iron-dissolved	AA-Direct	SUS
82002	Lead-total	AA-Solvent Extraction	SUS
12102	Magnesium	AA-Direct	SUS
25104	Manganese-dissolved	AA-Direct	SUS
07901	N-particulate	Elemental Analyzer	SUS
07651	N-total dissolved	Automated UV Colourimetric	SUS
10401	NFR	Gravimetric	SUS
28002	Nickel-total	AA-Solvent Extraction	SUS
07110	Nitrate/Nitrite	Colourimetric	SUS
07603	Nitrogen-total	Calculated	SUS
10650	Non-Carbonate Hardness	Calculated	SUS
18XXX	Organo Chlorines	Gas Chromatography	SUS
08101	Oxygen-dissolved	Winkler	SUS
15901	P-particulate	Calculated	SUS
15465	P-total dissolved	Automated Colourimetric	SUS
185XX	Phenoxy Herbicides	Gas Chromatography	SUS
15423	Phosphorus-total	Colourimetric (TRAACS)	SUS
19103	Potassium	Flame Emission	SUS
11250	Percent Sodium	Calculated	SUS
011201	SAR	Calculated	SUS
00210	Saturation Index	Calculated	SUS
34108	Selenium-dissolved	ICAP-hydride	SUS
14108	Silica	Automated Colourimetric	SUS
11103	Sodium	Flame Emission	SUS
00211	Stability Index	Calculated	SUS
16306	Sulphate	Automated Colourimetric	SUS
00201	TDS	Calculated	SUS
02061	Temperature	Digital Thermometer	SUS
02073	Turbidity	Nephelometry	SUS
23002	Vanadium-total	AA-Solvent Extraction	SUS
30005	Zinc-total	AA-Solvent Extraction	SUS
10301	PH	Electrometric	SUS
92111	Uranium	Fluometric	SUS

* - Computer Storage and Retrieval System -- Environment Canada
AA - Atomic Absorption
NFR - Nonfilterable Residue
ICAP - Inductively Coupled Argon Plasma.
IR - Infrared
MC - Monthly Composite
SUS -Suspended
UV - Ultraviolet
BM - Bimonthly (Alternate months sampled by USGS)

PARAMETERS

Responsible Agency: Saskatchewan Environment
Data Collected by: SaskPower

ESQUADAT* Code	Parameter	Analytical method	Sampling Frequency Station No.				
			2	3	4	5	6
10151	Alkalinity-phenol	Pot-Titration	Q	Q	Q	Q	OF
10101	Alkalinity-tot	Pot-Titration	Q	Q	Q	Q	OF
13004	Aluminum-tot	AA-Direct	A	A	A	A	
33004	Arsenic-tot	Flameless AA	A	A	A	A	
06201	Bicarbonates	Calculated	Q	Q	Q	Q	OF
05451	Boron-tot	ICAP	Q	Q	Q	Q	W
48002	Cadmium-tot	AA-Solvent Extract (MIBK)	A	A	A	A	
20103	Calcium	AA-Direct	Q	Q	Q	Q	OF
06052	Carbon-tot Inorganic	Infrared	Q	Q	Q		OF
06005	Carbon-tot Organic	Infrared	Q	Q	Q		OF
06301	Carbonates	Calculated	Q	Q	Q	Q	OF
17203	Chloride	Automated Colourimetric	Q	Q	Q	Q	OF
06711	Chlorophyll- 'a'	Spectrophotometry	Q	Q	Q	Q	
24004	Chromium-tot	AA-Direct	A	A	A	A	
36012	Coliform-fec	Membrane filtration	Q	Q	Q	Q	OF
36002	Coliform-tot	Membrane filtration	Q	Q	Q	Q	OF
02041	Conductivity	Conductivity Meter	Q	Q	Q	Q	W
29005	Copper-tot	AA-Solvent Extract (MIBK)	A	A	A	A	
09105	Fluoride	Specific Ion Electrode	A	A	A	A	
82002	Lead-tot	AA-Solvent Extract (MIBK)	A	A	A	A	
12102	Magnesium	AA-Direct	Q	Q	Q	Q	OF
80011	Mercury-tot	Flameless-AA	A	A	A	A	
42102	Molybdenum	AA-Solvent Extract (N-Butyl acetate)	A	A	A	A	
07015	N-TKN	Automated Colourimetric	Q	Q	Q	Q	OF
10401	NFR	Gravimetric	Q	Q	Q	Q	OF
10501	NFR(F)	Gravimetric	Q	Q	Q	Q	OF
28002	Nickel-tot	AA-Solvent Extract (MIBK)	Q	Q	Q	Q	OF
07110	Nitrate + NO_2	Automated Colourimetric	Q	Q	Q	Q	OF
06521	Oil and Grease	Pet. Ether Extraction	A	A	A	A	
08102	Oxygen-diss	Meter	Q	Q	Q	Q	OF
15406	Phosphorus-tot	Colourimetry	Q	Q	Q	Q	OF
19103	Potassium	Flame Photometry	Q	Q	Q	Q	OF
34005	Selenium-Ext	Hydride generation	A	A	A	A	
11103	Sodium	Flame Photometry	Q	Q	Q	Q	OF
16306	Sulphate	Colourimetry	Q	Q	Q	Q	OF
10451	TDS	Gravimetric	Q	Q	Q	Q	OF
02061	Temperature	Thermometer	Q	Q	Q	Q	OF
23004	Vanadium-tot	AA-Direct	A	A	A	A	
30005	Zinc-tot	AA-Solvent Extract (MIBK)	A	A	A	A	
10301	pH	Electrometric	Q	Q	Q	Q	W

- Computer storage and retrieval system - Saskatchewan Environment.

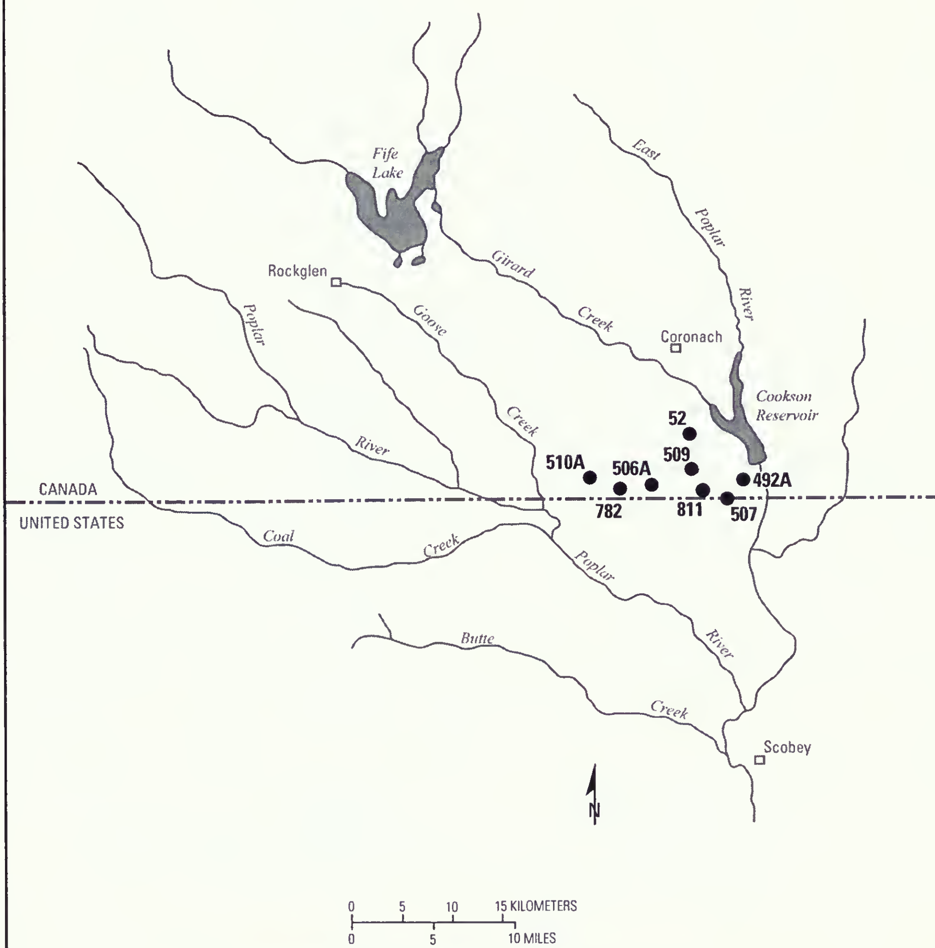
Symbols:
W – Weekly during overflow; OF – Once during each period of overflow greater than 2 weeks' duration;
Q – Quarterly; A – Annually; AA – Atomic Absorption; Pot – Potentiometric;
NFR – Nonfilterable residue; NFR(F) – Nonfilterable residue, fixed; ICAP – Inductively Coupled Argon Plasma;
AA – solvent extract (MIBK) – sample acidified and extracted with Methyl Isobutyl Ketone.

GROUND-WATER PIEZOMETERS TO MONITOR POTENTIAL DRAWDOWN DUE TO COAL-SEAM DEWATERING NEAR THE INTERNATIONAL BOUNDARY

[Symbol: ---, Data not available]

Responsible Agency: Saskatchewan Watershed Authority*			
Measurement Frequency: Quarterly			
Piezometer Number	**Location**	**Tip of Screen Elevation (m)**	**Perforation Zone (depth in metres)**
52	NW 14-1-27 W3	738.43	43-49 (in coal)
492A	---	---	---
506A	SW 4-1-27 W3	748.27	81-82 (in coal)
507	SW 6-1-26 W3	725.27	34 - 35 (in coal)
509	NW 11-1-27 W3	725.82	76 - 77 (in coal)
510A	NW 1-1-28 W3	769.34	28-29 (in layered coal and clay)
782	---	---	---
811	---	---	---

* Data Collected by: SaskPower



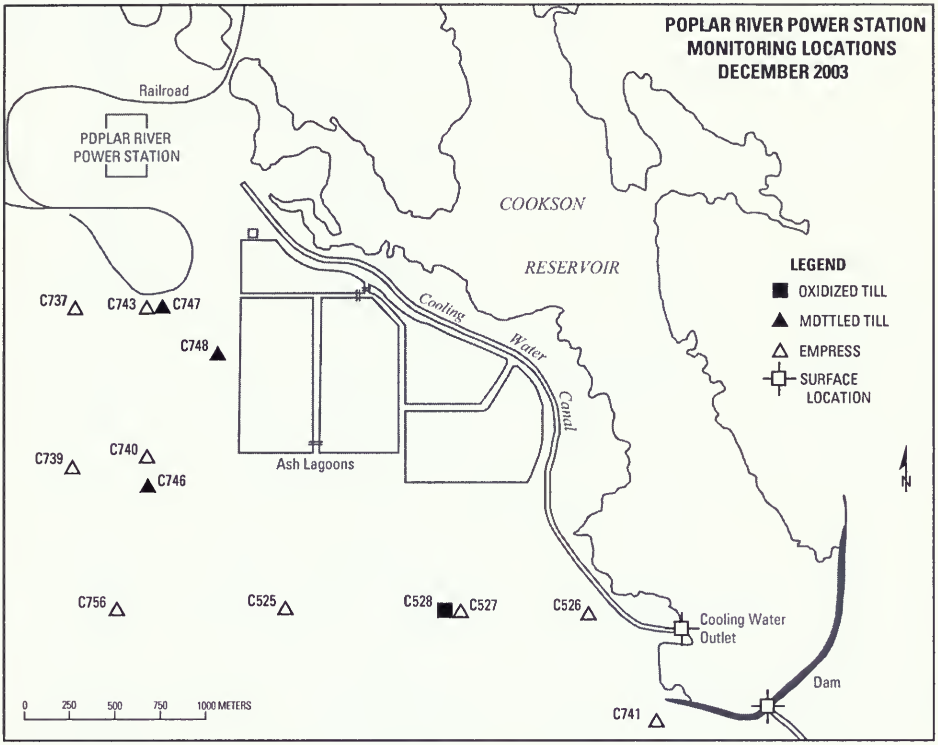
GROUND-WATER PIEZOMETERS TO MONITOR POTENTIAL DRAWDOWN DUE TO COAL-SEAM DEWATERING

GROUND-WATER PIEZOMETER MONITORING - POPLAR RIVER POWER STATION AREA	
SPC Piezometer Number	**Completion Formation**
C525	Empress
C526	Empress
C527	Empress
C528	Oxidized
C539	Empress
C540	Empress
C737	Empress
C739	Empress
C740	Empress
C741	Empress
C743	Empress
C746	Mottled Till
C747	Mottled Till
C748	Mottled Till
C756	Empress

Water levels measured quarterly

SPC Piezometer Number	**Completion Formation**
C739	Empress

Samples collected annually


POPLAR RIVER POWER STATION
MONITORING LOCATIONS
DECEMBER 2003
Railroad
POPLAR RIVER
POWER STATION
COOKSON
RESERVOIR
LEGEND
OXIDIZED TILL
MOTTLED TILL
EMPRESS
SURFACE
LOCATION
Cooling Water Canal
Ash Lagoons
C737
C743
C747
C748
C739
C740
C746
C756
C525
C528
C527
C526
C741
Cooling Water
Outlet
Dam
N
0
250
500
750
1000 METERS

GROUND-WATER PIEZOMETER MONITORING— ASH LAGOON AREA – WATER LEVEL	
SPC Piezometer Number	**Completion Formation**
C529	Empress
C653A	Unoxidized Till
C712D	Oxidized Till
C714C	Oxidized Till
C726C	Oxidized Till
C727C	Oxidized Till
C728D	Oxidized Till
C763A	Mottled Till
C763C	Mottled Till
C763E	Empress
C764B	Mottled Till
C764C	Oxidized Till
C764D	Unoxidized Till
C764E	Empress
C765A	Empress
C765C	Oxidized Till
C765D	Oxidized Till
C765E	Mottled Till
C766A	Empress
C767A	Empress
C767B	Unoxidized Till
C775C	Unoxidized Till
C776B	Oxidized Till
C867C	Unoxidized Till
C868C	Unoxidized Till
C869C	Unoxidized Till
C871C	Unoxidized Till

Water levels measured quarterly

Responsible Agency: Saskatchewan Environment
Data Collected by: SaskPower

GROUND-WATER PIEZOMETER MONITORING-- ASH LAGOON AREA – WATER QUALITY	
SPC Piezometer Number	**Completion Formation**
C533	Empress
C534	Oxidized Till
C654	
C711	
C712A	Unoxidized Till
C712B	Intra Till Sand
C712C	Mottled Till
C712D	Oxidized Till
C713	Oxidized Till
C714A	Unoxidized Till
C714B	
C714C	Oxidized Till
C714D	Oxidized Till
C714E	Empress
C715	Oxidized Till
C717	
C720	
C721	
C722	
C723	
C724	
C725	
C726B	
C726C	Oxidized Till
C726E	Empress
C728A	Oxidized Till
C728C	Mottled Till
C728D	Oxidized Till
C728E	Empress

GROUND-WATER PIEZOMETER MONITORING-- ASH LAGOON AREA – WATER QUALITY	
SPC Piezometer Number	**Completion Formation**
C741	
C742	Empress
C758	Intra Till Sand
C763A	Mottled Till
C763B	Oxidized Till
C763D	Unoxidized Till
C763E	Empress
C767	Intra Till Sand
C867B	Oxidized Till
C867C	Unoxidized Till
C868B	Oxidized Till
C868C	Unoxidized Till
C869B	Oxidized Till
C870E	Empress
C871C	Unoxidized Till
C872B	Oxidized Till
C873E	Empress

Samples collected annually.

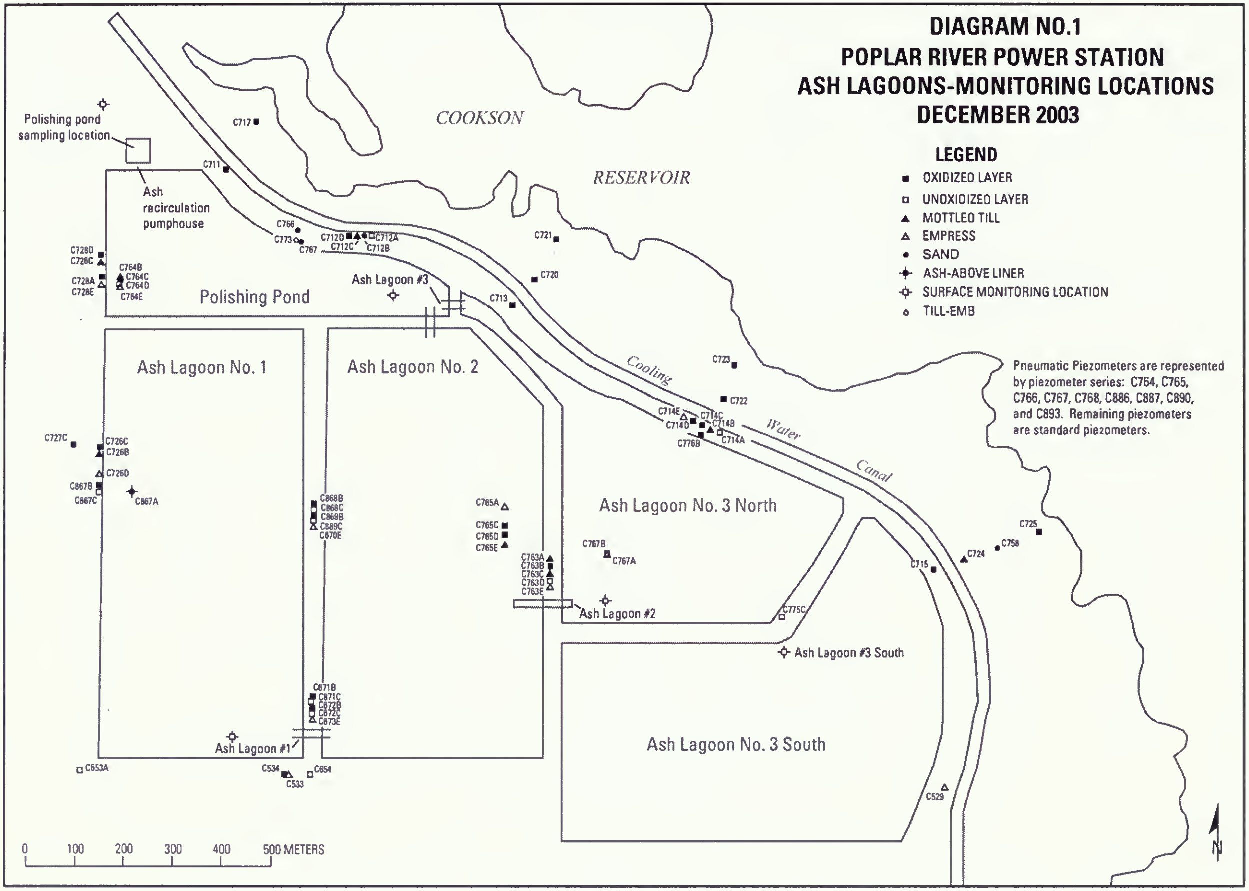


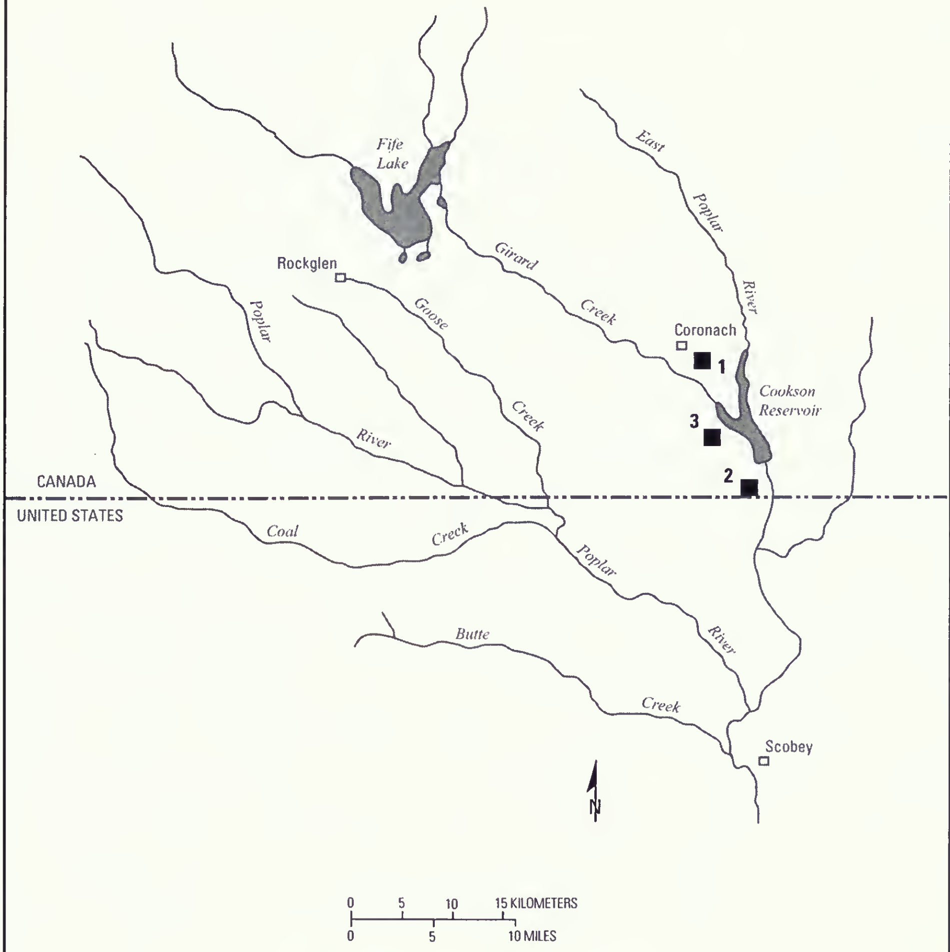
DIAGRAM NO.1
POPLAR RIVER POWER STATION
ASH LAGOONS-MONITORING LOCATIONS
DECEMBER 2003
LEGEND
OXIDIZED LAYER
UNOXIDIZED LAYER
MOTTLED TILL
EMPRESS
SAND
ASH-ABOVE LINER
SURFACE MONITORING LOCATION
TILL-EMB
Pneumatic Piezometers are represented by piezometer series: C764, C765, C766, C767, C768, C886, C887, C890, and C893. Remaining piezometers are standard piezometers.
COOKSON
RESERVOIR
Cooling Water Canal
Polishing pond sampling location
Ash recirculation pumphouse
Polishing Pond
Ash Lagoon No. 1
Ash Lagoon No. 2
Ash Lagoon No. 3 North
Ash Lagoon No. 3 South
Ash Lagoon #1
Ash Lagoon #2
Ash Lagoon #3
Ash Lagoon #3 South
0
100
200
300
400
500 METERS
N

Ambient Air-Quality Monitoring

Responsible Agency: Saskatchewan Environment
Data Collected by: SaskPower

No. On Map	Location	Parameters	Reporting Frequency
1	Coronach (Discontinued)	Sulphur Dioxide	Continuous monitoring with hourly averages as summary statistics.
		Total Suspended Particulate	24-hour samples on 6-day cycle, corresponding to the national air pollution surveillance sampling schedule.
2	International Boundary	Sulphur Dioxide	Continuous monitoring with hourly averages as summary statistics.
		Total Suspended Particulate	24-hour samples on 6-day cycle, corresponding to the national air pollution surveillance sampling schedule.
3	PRPS Site	Wind Speed and Direction	Continuous monitoring with hourly averages as summary statistics

METHODS	
Sulphur Dioxide	Saskatchewan Environment Pulsed fluorescence
Total Suspended Particulate	Saskatchewan Environment High Volume Method



AMBIENT AIR-QUALITY MONITORING (CANADA)

POPLAR RIVER

COOPERATIVE MONITORING ARRANGEMENT

TECHNICAL MONITORING SCHEDULES

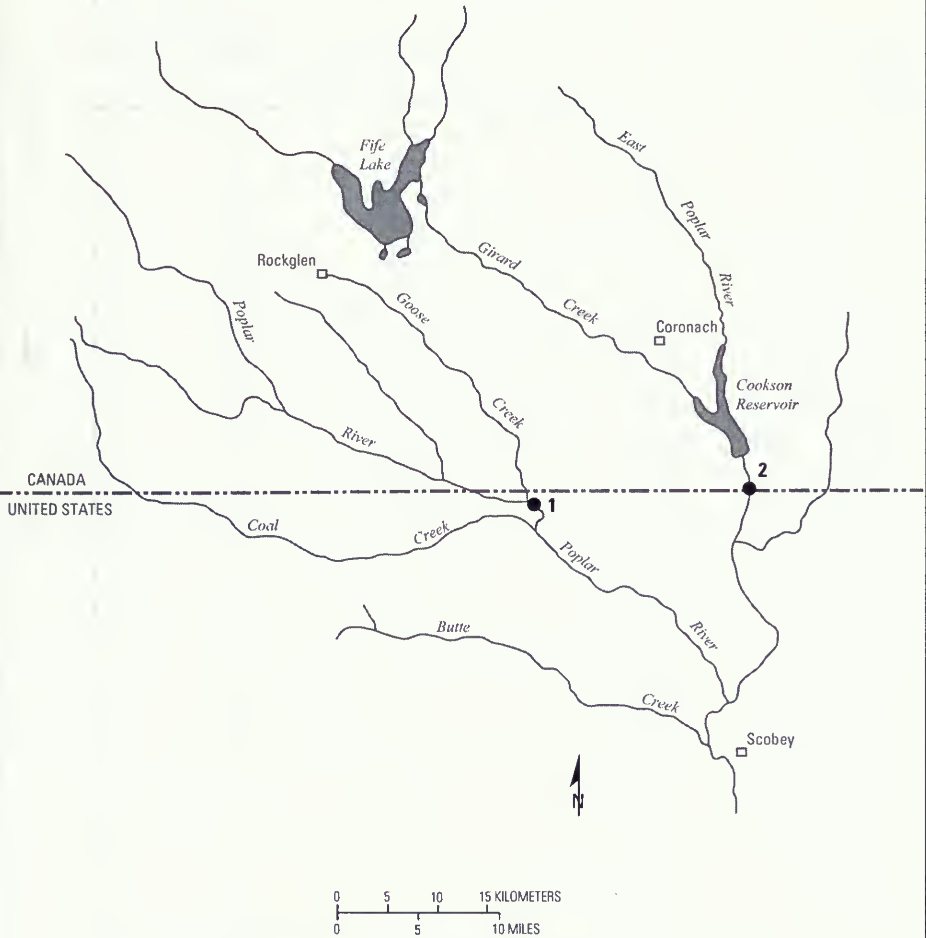
2004

UNITED STATES

STREAMFLOW MONITORING

Responsible Agency: U.S. Geological Survey		
No. on Map	**Station Number**	**Station Name**
1*	06178000 (11AE008)	Poplar River at International Boundary
2*	06178500 (11AE003)	East Poplar River at International Boundary

* International Gauging Station



HYDROMETRIC GAUGING STATIONS (UNITED STATES)

SURFACE-WATER-QUALITY MONITORING -- Station Locations

Responsible Agency: U.S. Geological Survey

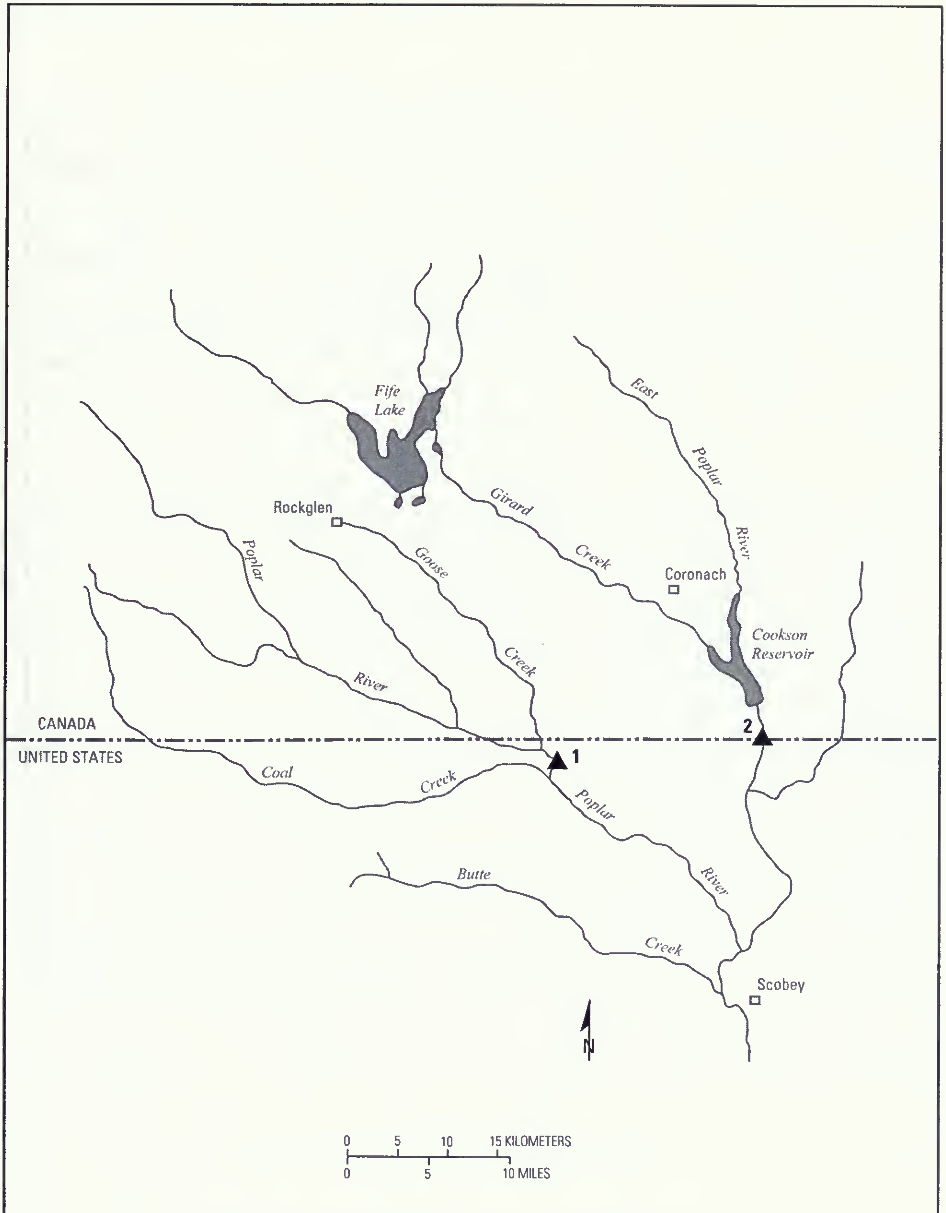
No. On Map	USGS Station No.	STATION NAME
1	06178000	Poplar River at International Boundary
2	06178500	East Poplar River at International Boundary

PARAMETERS

			Annual Sampling Frequency	
Analytical Code	Parameter	Analytical Method	Site 1*	Site 2**
29801	Alkalinity - lab	Elect. Titration	4	4
00625	Ammonia +Org N-tot	Colorimetric	4	4
00608	Ammonia - diss	Colorimetric	4	4
01000	Arsenic - diss	ICP, MS	4	4
01002	Arsenic - tot	AA, GF	4	4
01005	Barium - diss	ICP, MS	4	4
01012	Barium – total	ICP, MS	4	4
00025	Barometric pressure	Barometer, field	4	4
01025	Cadmium - diss	ICP, MS	4	4
01027	Cadmium - tot/rec	ICP, MS	4	4
00915	Calcium - diss	ICP	4	4
00940	Chloride - diss	IC	4	4
01030	Chromium - diss	AA, GF	4	4
01034	Chromium - tot/rec	AA, GF	4	4
00095	Conductivity	Wheatstone Bridge	4	4
01040	Copper – diss	ICP, MS	4	4
01042	Copper – tot/rec	ICP, MS	4	4
00061	Discharge - inst	Direct measurement	4	4
00950	Fluoride - diss	ISE	4	4
01046	Iron - diss	ICP	4	4
01045	Iron - tot/rec	ICP	4	4
01049	Lead - diss	ICP	4	4
01051	Lead - tot/rec	ICP, MS	4	4
00925	Magnesium - diss	ICP	4	4
01056	Manganese - diss	ICP, MS	4	4
01055	Manganese - tot/rec	ICP, MS	4	4
01065	Nickel - diss	ICP, MS	4	4
71892	Mercury - diss	CVAF	4	4
71890	Mercury – tot/rec	CVAF	4	4
01067	Nickel - diss	ICP, MS	4	4
00613	Nitrite - diss	Colorimetric	4	4
00631	Nitrate + Nitrite - diss	Colorimetric	4	4
00300	Oxygen-diss	Oxygen membrane, field	4	4
00400	pH	Electrometric, field	4	4
00671	Phos, Ortho-diss	Colorimetric	4	4
00665	Phosphorous - tot	Colorimetric	4	4
00935	Potassium - diss	AA	4	4
00931	SAR	Calculated	4	4
80154	Sediment - conc.	Filtration-Gravimetric	4	4
80155	Sediment - load	Calculated	4	4
01145	Selenium - diss	ICP, MS	4	4
01147	Selenium tot	ICP, MS	4	4
00955	Silica - diss	Colorimetric	4	4
00930	Sodium - diss	ICP	4	4
00945	Sulphate - diss	IC	4	4
70301	Total Dissolved Solids	Calculated	4	4
00010	Temp Water	Stem Thermometer	4	4
00020	Temp Air	Stem Thermometer	4	4
01090	Zinc - diss	ICP, MS	4	4
01092	Zinc - tot/rec	ICP, MS	4	4

Samples collected obtained during the monthly periods:
* -- March - April; May; June; July - September
** -- May; June; July; August - September

Abbreviations: **AA** - atomic absorption; **AE** - atomic emission; **conc.** – concentration; **CVAF** – cold vapor atomic fluorescence; **diss** – dissolved; **GF** - graphite furnace; **IC** - ion exchange chromatography; **ICP** - inductively coupled plasma; **ISE** – ion-selective electrode; **LIP** – Laser Induced Phosphorescence; **MS** – mass spectrography ; **Org** – organic; **tot/rec** - total recoverable



SURFACE-WATER-QUALITY MONITORING STATIONS (UNITED STATES)

GROUND-WATER-QUALITY MONITORING -- Station Locations

Responsible Agency: Montana Bureau of Mines and Geology

Map Number	Well Location	Total Depth (a) (m)	Casing Diameter (cm)	Aquifer	Perforation Zone (m)
7	37N47E12BBBB	44.1	10.2	Hart Coal	39-44
16	37N46E3ABAB	25.5	10.2	Fort Union	23-25
24	37N48E5AB	9.6	10.2	Alluvium	9.2-9.6

Parameters

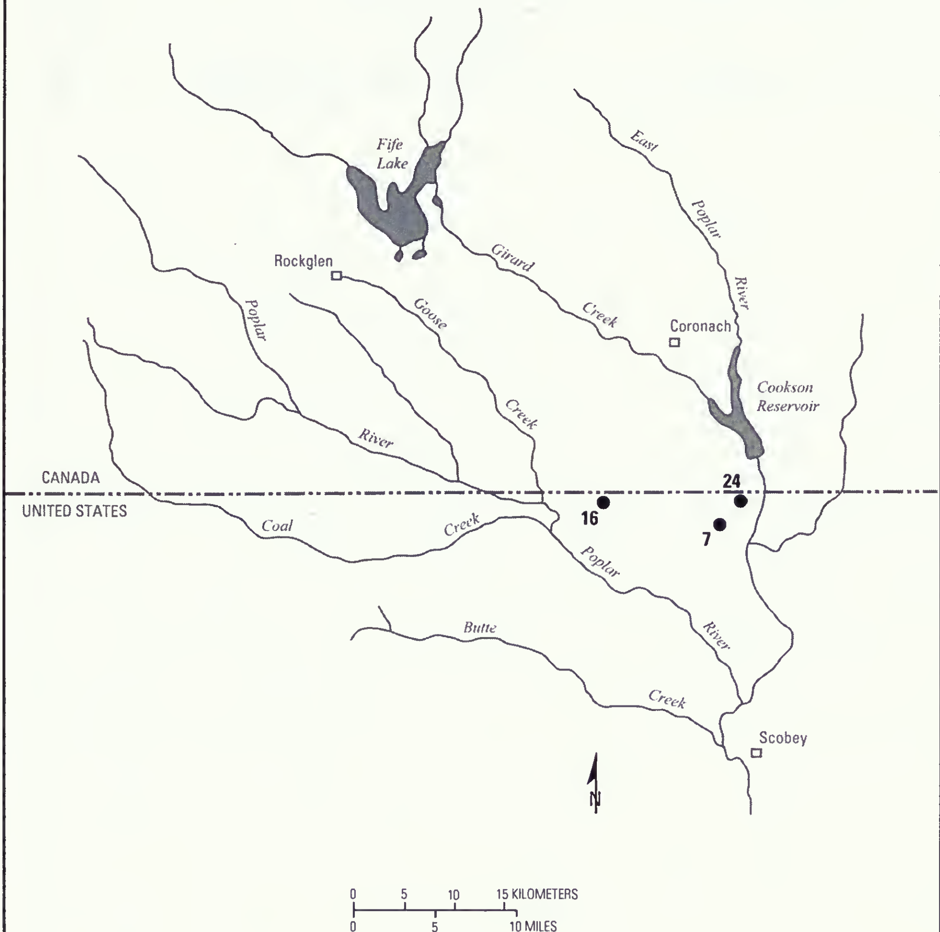
Storet ** Code	Parameter	Analytical Method	Sampling Frequency Station No.
00440	Bicarbonates	Electrometric Titration	Sample collection is annually for all locations identified above.
01020	Boron-diss	Emission Plasma, ICP	
00915	Calcium	Emission Plasma	
00445	Carbonates	Electrometric Titration	The analytical method descriptions are those of the Montana Bureau of Mines and Geology Laboratory where the samples are analysed.
00940	Chloride	Ion Chromatography	
00095	Conductivity	Wheatstone Bridge	
00950	Fluoride	Ion Chromatography	
01046	Iron-diss	Emission Plasma, ICP	
01049	Lead-diss	Emission Plasma, ICP	
01130	Lithium-diss	Emission Plasma, ICP	
00925	Magnesium	Emission Plasma, ICP	
01056	Manganese-diss	Emission Plasma, ICP	
01060	Molybdenum	Emission Plasma, ICP-MS	
00630	Nitrate	Ion Chromatography	
00400	pH	Electrometric	
00935	Potassium	Emission Plasma, ICP	
00931	SAR	Calculated	
01145	Selenium-diss	ICP-MS	
00955	Silica	Emission Plasma, ICP-MS	
00930	Sodium	Emission Plasma, ICP	
01080	Strontium-diss	Emission Plasma, ICP	
00445	Sulphate	Ion Chromatography	
00190	Zinc-diss	Emission Plasma, ICP	
70301	TDS	Calculated	

SYMBOLS:

** - Computer storage and retrieval system -- EPA

ICP - Inductively Coupled Plasma Unit

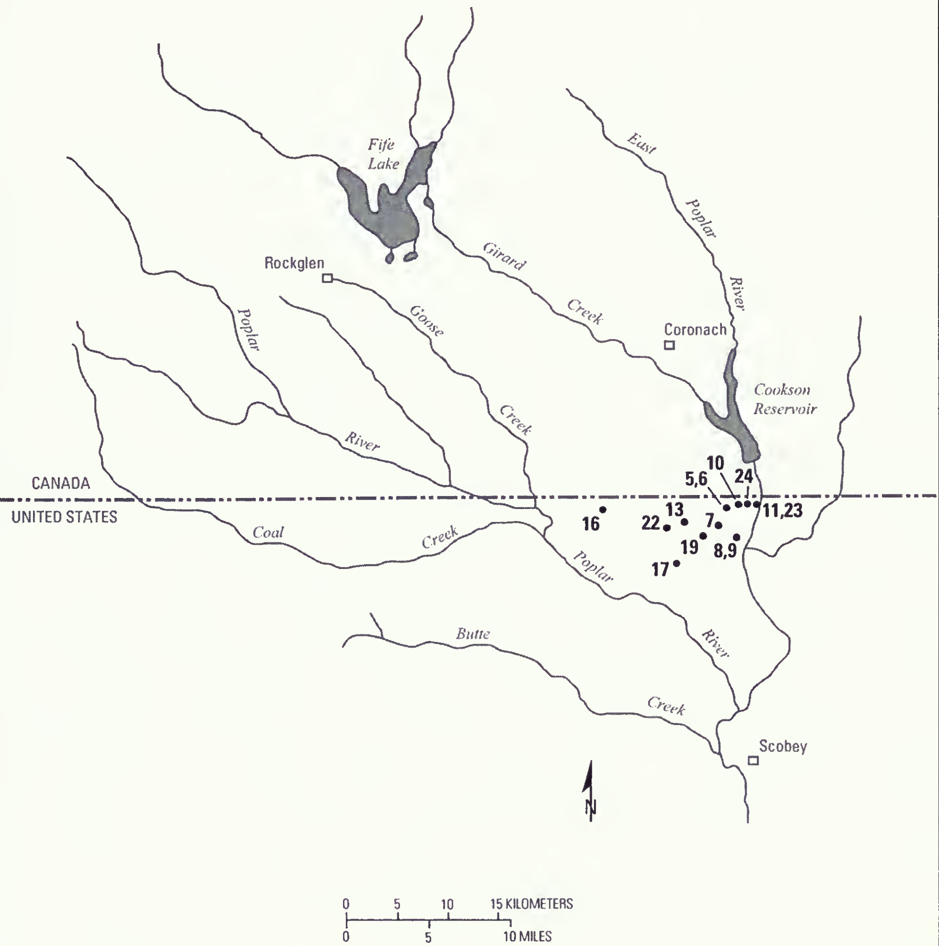
ICP - MS - Inductively Coupled Plasma - Mass Spectrometry



GROUND-WATER-QUALITY MONITORING (UNITED STATES)

GROUND-WATER LEVELS TO MONITOR POTENTIAL DRAWDOWN DUE TO COAL-SEAM DEWATERING

Responsible Agency: Montana Bureau of Mines and Geology	
No. on Map	**Sampling**
5,6,7,8,9,10,11,13,16,17,19,22,23,24	Determine water levels quarterly



GROUND-WATER PIEZOMETERS TO MONITOR POTENTIAL DRAWDOWN DUE TO COAL-SEAM DEWATERING

ANNEX 3

RECOMMENDED FLOW APPORTIONMENT

IN THE POPLAR RIVER BASIN

BY THE INTERNATIONAL SOURIS-RED RIVERS ENGINEERING BOARD,

POPLAR RIVER TASK FORCE (1976)

*RECOMMENDED FLOW APPORTIONMENT IN THE POPLAR RIVER BASIN

The aggregate natural flow of all streams and tributaries in the Poplar River Basin crossing the International Boundary shall be divided equally between Canada and the United States subject to the following conditions:

1. The total natural flow of the West Fork Poplar River and all its tributaries crossing the International Boundary shall be divided equally between Canada and the United States but the flow at the International Boundary in each tributary shall not be depleted by more than 60 percent of its natural flow.

2. The total natural flow of all remaining streams and tributaries in the Poplar River Basin crossing the International Boundary shall be divided equally between Canada and the United States. Specific conditions of this division are as follows:

    (a) Canada shall deliver to the United States a minimum of 60 percent of the natural flow of the Middle Fork Poplar River at the International Boundary, as determined below the confluence of Goose Creek and Middle Fork.

    (b) The delivery of water from Canada to the United States on the East Poplar River shall be determined on or about the first day of June of each year as follows:

        (i) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period does not exceed 4,690 cubic decameters (3,800 acre-feet), then a continuous minimum flow of 0.028 cubic metres per second (1.0 cubic foot per second) shall be delivered to the United States on the East Poplar River at the International Boundary throughout the succeeding 12 month period commencing June 1st. In addition, a volume of 370 cubic decameters (300 acre-feet) shall be delivered to the United States upon demand at any time during the 12 month period commencing June 1st.

        (ii) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period is greater than 4,690 cubic decameters (3,800 acre-feet), but does not exceed 9,250 cubic decameters (7,500 acre-feet),

* Canada-United States, 1976, Joint studies for flow apportionment, Poplar River Basin, Montana-Saskatchewan: Main Report, International Souris-Red Rivers Board, Poplar River Task Force, 43 pp.

then a continuous minimum flow of 0.057 cubic metres per second (2.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International Boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.028 cubic metres per second (1.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 617 cubic decameters (500 acre-feet) shall be delivered to the United States upon demand at any time during the 12-month period commencing June 1st.

(iii) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period is greater than 9,250 cubic decameters (7,500 acre-feet), but does not exceed 14,800 cubic decameters (12,000 acre-feet), then a continuous minimum flow of 0.085 cubic metres per second (3.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International Boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.057 cubic metres per second (2.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 617 cubic decameters (500 acre-feet) shall be delivered to the United States upon demand at any time during the 12 month period commencing June 1st.

(iv) When the total natural flow of the Middle Fork Poplar, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period exceeds 14,800 cubic decameters (12,000 acre-feet) then a continuous minimum flow of 0.085 cubic metres per second (3.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International Boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.057 cubic metres per second (2.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 1,230 cubic decameters (1,000 acre-feet) shall be delivered to the United States upon demand at any time during the 12-month period commencing June 1st.

(c) The natural flow at the International Boundary in each of the remaining individual tributaries shall not be depleted by more than 60 percent of its natural flow.

3. The natural flow and division periods for apportionment purposes shall be determined, unless otherwise specified, for periods of time commensurate with the uses and requirements of both countries.

ANNEX 4

CONVERSION FACTORS

CONVERSION FACTORS

Ac	=	4,047 m^3 = 0.04047 ha
ac-ft	=	1,233.5 m^3 = 1.2335 dam^3
C°	=	5/9(F°-32)
cm	=	0.3937 in.
cm^2	=	0.155 in^2
dam^3	=	1,000 m^3 = 0.8107 ac-ft
ft^3	=	28.3171 x $10^{-3} m^3$
ha	=	10,000 m^2 = 2.471 ac
hm	=	100 m = 328.08 ft
hm^3	=	1 x 10^6 m^3
I.gpm	=	0.0758 L/s
in	=	2.54 cm
kg	=	2.20462 lb = 1.1 x 10^{-3} tons
km	=	0.62137 miles
km^2	=	0.3861 mi^2
L	=	0.3532 ft^3 = 0.21997 I. gal = 0.26420 U.S. gal
L/s	=	0.035 cfs = 13.193 I.gpm = 15.848 U.S. gpm
m	=	3.2808 ft
m^2	=	10.765 ft^2
m^3	=	1,000 L = 35.3144 ft^3 = 219.97 I. gal= 264.2 U.S. gal
m^3/s	=	35.314 ft^3/s
mm	=	0.00328 ft
tonne	=	1,000 kg = 1.1023 ton (short)
U.S. gpm	=	0.0631 L/s

For Air Samples

ppm = 100 pphm = 1000 x (Molecular Weight of substance/24.45) mg/m^3